The Journal of Documentary Reproduction

DECEMBER • 1941

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Volume 4 • Number 4

A QUARTERLY REVIEW OF THE APPLICATION OF PHOTOGRAPHY AND ALLIED TECHNIQUES TO LIBRARY, MUSEUM AND ARCHIVAL SERVICE

THE JOURNAL OF DOCUMENTARY REPRODUCTION was established to meet a need for an independent, critical, impartial periodical in this field, and is published on a cooperative nonprofit basis. It deals with problems confronting scholars, scientists, archivists, librarians, editors and other concerned groups. The JOURNAL, in attempting to meet this need, urges other periodicals to continue disseminating helpful news concerning scientific aids to learning, and seeks their cooperation, as its editors and publishers are motivated only by the spirit of scientific inquiry and service to scholarship.

The Editorial Board is assisted by members of several organizations interested in the scope of a professional periodical devoted to the use of photography and related processes in reproducing materials in print and manuscript form. Improvements and new procedures are appearing so rapidly that a central source of information is essential, particularly if science and scholarship are to receive the greatest benefits from the application of these means to definite educational ends.

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The Current Microcopying Program in England

D. H. DAUGHERTY

At the invitation of the American Council of Learned Societies more than fifty representatives of libraries, universities, governmental agencies, and other institutions and organizations concerned with the reproduction of scholarly and scientific materials in facsimile met in Washington, D.C., on June 5-6, 1940, as a "Conference on Microcopying Materials for Research in Foreign Depositories." Although the principal purpose of the Conference was to encourage "the correlation of the numerous plans, projects, and schemes for the reproduction of research materials, with particular reference to the European conflict," [1] account was taken in the discussions of a large number of topics related to the documentary uses of microfilm. The Conference was not constituted as a continuing body, but provision was made for effective consideration of its recommendations by the appointment, during the meetings, of a Continuation Committee which, in turn, was able to inangurate a large-scale program for copying materials in England.

The officers of the Conference were Dr. Waldo G. Leland and Dr. H. M. Lydenberg, Co-chairmen, and Dr. Vernon D. Tate, Recorder. The agenda consisted of the following major topics, each of which was discussed from a variety of points of view: (1) agencies and facilities for microphotography and present projects for microcopying, (2) technical considerations and problems, (3) general problems growing out of conditions in Europe and the Orient, (4) problems of selection of materials, (5) problems of organization, direction, and support of operations of copying, (6) problems of the receipt, housing, and servicing of materials.

To provide a useful background of information, members of the Conference were called upon to name and describe the agencies most active

[1] This review of the Conference and subsequent developments is based upon the unpublished report of the Recorder and the minutes and reports of the Committee on Microcopying Materials for Research.

in the production of microphotography, particularly those in the United States. In a similar way, major projects for photographic reproduction were enumerated. The Conference emphasized the desirability of establishing and maintaining a central list of agencies and projects, including a census of equipment.

The discussions of technical problems included evaluations (in terms of cost, convenience, durability, reduction ratios, etc.) of materials and apparatus for the manufacture of microcopy on film. Attention was given also to the need for providing technical training and information for machine operators, supervisors of field work, administrators in charge of servicing collections, and for the users of the film. Extensive copying in some foreign depositories, for example, cannot successfully be carried out until both equipment and properly trained personnel are provided.

In reviewing a number of administrative and scholarly considerations which affect the organization of extensive projects for copying abroad, the Conference directed attention to the problems which arise in different regions and depositories, to situations which are determined by the character of the materials to be copied and the way in which they are to be used, and to the requirements of a program intended to meet immediate needs as compared with one designed to anticipate the needs of the future. Specific classes of material were mentioned to illustrate the opportunities for eventual acquisitions in different parts of the world, and references were made to depositories in Europe, Asia, Africa, Oceania, and Latin America. The Conference repeatedly expressed the necessity for the coordination, on a national basis, of activities of organizations, institutions, and individuals engaged in obtaining microcopy from foreign countries.

Problems involved in the selection of materials and in the cataloging and distribution of films received were discussed in relation to the need for comprehensive surveys of the resources and wants of institutions in this country, combined with studies of holdings abroad. The desirability of the completion of the Union Catalog at the Library of Congress was stressed, and it was recommended that a union catalog of microfilms be established, at the Library of Congress or elsewhere, to which accessions from abroad would be reported on cards.

All of the discussions of possible projects were influenced by the fact

of war in Europe, where many valuable collections had already been damaged or destroyed. Opinion was divided as to whether it would be possible to conduct an emergency program for the copying of masses of materials in any of the warring nations. Evidence was presented, however, in support of the view that large-scale copying in England could probably be undertaken. The Continuation Committee was instructed to investigate that possibility and to act in relation to its findings. It was agreed that emergency activities, directed towards the preservation of rare materials rather than towards their immediate utilization, would require the prompt cooperation of individuals and groups in the assembling of want lists and the selection of materials to be copied. The Continuation Committee was urged to obtain the advice and assistance of interested persons and organizations.[2]

Following the Conference, the Continuation Committee investigated the practicability of a program for copying in England and, at the same time, began to assemble preliminary want lists. A questionnaire addressed to historians by Mr. Herbert A. Kellar produced an imposing list of items in foreign libraries and archives, desired by American scholars but not available here, and, later, similar lists were obtained for other disciplines. It was established that work could be done in England and that the custodians of English depositories were eager to assist efforts to preserve their collections. In response to an application, sponsored by the American Council of Learned Societies and the Library of Congress, the Rockefeller Foundation, in January 1941, made an award of $30,000 in support of the project, and operations were begun in 1941. The Continuation Committee was named a standing committee of the Council and re-designated as the Committee on Microcopying Materials for Research.[3] A second generous grant of $100,000 from the Rockefeller Foundation was made in September 1941, and the work is being successfully continued.

[2] The complete proceedings of the Conference, transcribed from a stenotyped record, have been microfilmed, and duplicates may be purchased from the Photo-Duplication Service of the Library of Congress.

[3] Keyes D. Metcalf, Harvard University, *Chairman;* Herbert A. Kellar, McCormick Historical Association; H. M. Lydenberg, New York Public Library; Archibald MacLeish, Librarian of Congress; George A. Schwegmann, Library of Congress; Irvin Stewart, Committee on Scientific Aids to Learning; Vernon D. Tate, The National Archives; D. H. Daugherty, Executive Offices, American Council of Learned Societies, Secretary.

In organizing the program for copying in England, the following general arrangements were adopted:

The supervision of the project was entrusted to the Committee on Microcopying Materials for Research, assisted by a subcommittee on selection, composed of Herbert A. Kellar, Chairman, Percy W. Long, Secretary of the Modern Language Association of America, and George W. Cottrell, Jr., Executive Secretary of the Mediaeval Academy of America.

The execution of the work, including the supply of apparatus, material, and personnel, and the production of the microcopies, was entrusted to University Microfilms, of Ann Arbor, Michigan (Eugene B. Power, President). University Microfilms obtained the services of Mr. Arundell Esdaile, former director of the British Museum, to give direct supervision to activities in England and to make the necessary arrangements with the authorities and the custodians of collections.

The finished films are delivered to the American Embassy in London, which certifies their receipt to the Library of Congress and, through special agreement with a shipping house, dispatches the films, in small consignments by steamer, to the Library of Congress. The library accessions the film, after it has been checked by University Microfilms, as a part of its permanent collections. The use of the film is subject to the regulations of the library, which has agreed with the custodians of the originals to apply such special restrictions as may be necessary to preserve the rights of former owners of the originals under English law.

In preparing to make selections, the subcommittee made an extensive canvass of the needs of scholars, with special reference to the future. These needs were expressed by individuals, by groups of scholars, and by the directors of large-scale scholarly projects, e.g., the dictionaries of Middle and Early Modern English. The range of subjects covered in the want lists and the selections is wide, including American and European history, legal history, the history of science and medicine, literary and philological studies, medieval studies, classical studies, Slavic and Oriental studies, the fine arts, music. In the interest of rapid execution of the project, the subcommittee has not included isolated items, as fragments of manuscripts, but has, where possible, had entire manuscripts or volumes copied in series. The material in the lists from which

selections are made aggregates more than 25,000 volumes, or more than 10,000,000 pages.

University Microfilms has provided a battery of seven cameras and expects, if possible, to add to that number. The funds which have been made available should be sufficient to produce more than three and one-half million frames of film covering nearly twice that number of pages. The immediate aim of the project is preservation rather than utilization, and the funds provided are for that purpose. As soon as possible, however, adequate catalogs will be made, and the film will be edited and made available for consultation or reproduction.

Lantern Slide Production at the Philadelphia Museum of Art

PAUL VANDERBILT

THE MOST SIGNIFICANT applications of microphotography to date have been made in copying, at high speed, material of such uniform size that the camera, once set, will photograph a fairly long run without refocusing. Little attention has been given to speeding up and standardizing microphotographic copying of illustrative material which varies in size from frame to frame. This article deals with one museum's experience in such a direction.

Our problem at the Philadelphia Museum of Art was to produce, within a year or two, an abundant supply of illustrative material in order to extend the library's resources into the educational field, and to do this without a large investment either for equipment or maintenance, using WPA personnel. Our job was to meet adequately a practical demand within set limitations and not to produce technically faultless work.

Past experience led us to discard, as not meeting the emergency, all of the following: use of large reproductions (too expensive with too limited a supply); episcopes for projecting by reflected light directly from postcards, photographs and reproductions in books (lack of brilliance, irregularity of size, and unevenness of performance); purchase of lantern slides (too expensive and material wanted not available); film strips (impossibility of interfiling, likelihood of damage in repeated searching and handling, difficulty of vertical-horizontal uniformity); production of lantern slides by the conventional method of individual treatment by an experienced copy photographer (too slow). We turned to a simplified version, adapted to WPA capacity, of microphotographic mass-reproduction technique. If we have developed conceptions of the work and its eventual broad application, technical though not yet scientific standards, working routines, and specially adapted equipment which might interest others engaged in similar work, these facts seem to be worth publishing.

The trend today is toward the use of small 2 x 2 inch slides, consisting of double frames cut from 35mm. film mounted between thin glasses, rather than the "standard" 3¼ x 4 inch ones. Rapid production by a staff, rather than an individual, and the requisite standardization of exposure, development and recording routines, point to the handling of entire rolls at one time. As use of lantern slides becomes more informal, and an appeal is made to small lecture groups, photographic excellence yields in importance to other considerations: low cost, which permits slides wanted but not already in the files to be made quickly on demand, ease of transportation of both slides and projector, a plentiful, varied selection of material, color slides as well as black and white. Certainly the trend is to have as many color slides as possible, and, for reasons of cost if no other, they must be of the smaller size in most institutions. We are convinced that when small slides are made with equal care, and projected under equally efficient conditions, they are, for practical purposes in visual education, as effective as the larger ones. The simpler projectors can be lent to users with the slides and carried away in a brief case. A collection of small slides takes up about one third the storage space required by an equal number of standard slides. A great deal of the material copied from library books is already technically limited, and, slightly improved definition does not justify extensive technical treatment. Cooperative undertakings of the future, interlending of existing negatives, printing from one negative for a group of positive subscribers, etc., are most likely to be practical only when 35mm. film is used.

The most familiar argument against the use of small slides is, I suspect, that an institution already has a great collection of standard slides and does not wish to mix the sizes. The Philadelphia Museum of Art had a collection of about 3500 standard slides when the small slide project was started. Disposition of the former has not been definitely decided, but we have already copied many of the large slides in the smaller size, and will probably eventually retain only certain lecture sets from the old file. Still, when our own small file must be augmented for a certain lecture by borrowing from other collections, we may be able to get only large slides. We are working on a solution to this difficulty by using two projectors—one for 3¼ x 4 inch slides, and the other a standard size projector with a lens of shorter focal length, for 2 x 2 inch slides

either singly or in pairs, for comparative purposes. In the projection of two slides simultaneously on the screen, an increasingly pressing educational desideratum, the smaller size presents very definite advantages in smoothness of operation. We decided to make slides only in the 2 x 2 inch size on the grounds of cost, adaptability to a WPA project, and anticipation of economical opportunities for future growth.

We have the following classes of material to be copied: (1). Existing negatives, ranging from 8 x 10 inches to 35mm. in size, representing mostly objects of art in this museum, (2). Files of original photographs, among our own resources and available as loans, (3). Illustrations in books, periodicals, catalogs, clipping files, etc. We estimate 3,000,000 illustrations in a library of 20,000 volumes. For effective bulk production of lantern slides, we copy entire lots of these, taking all that is of sufficient importance and quality to be educationally useful, such as all the negatives of American furniture, all the plates in a book of good reproductions, etc. This is the first point in our program of standardization and speeding up operations. In addition, we have to make series of slides for the requirements of special lecturers, usually from a variety of sources covering the same subject. When anything is to be copied from a book, we try to take from that volume other illustrations which may be needed later on.

Our camera is a standard model E Leica with a 50mm. Elmar lens, but with several specially constructed features (see Fig. 1). The ideas for the camera adaptation were derived partly from Miss Woodruff, of the Index of Christian art at Princeton University, partly from the Recordak camera, and partly from a unique Leica assembly in the Leitz laboratory in New York which was not on the market last summer. The standard bracket arm has been mounted on a 60-inch chrome-plated brass pole. A gear track has been mounted on the pole. To the tightening screw at the back of the bracket arm has been added a gear and knob, so that revolving the knob will cause the camera to travel up and down the pole. There is sufficient tension so that the tightening screw is not necessary. The same result could have been obtained with a spring sash balance and a friction wheel without gears. The pole and track are supported at top and bottom by V-shaped brackets extending 18 inches from the wall so as to leave space under the pole for the bookholder to move freely into

any position. The bracket arm itself has been covered with nonreflecting cloth, as the original finish caused reflections in the glass top of the book-holder. The camera on the bracket arm is used in conjunction with a new model Leitz sliding focusing device, which allows the lens barrel to be pushed a little farther in than was possible with the old model. The

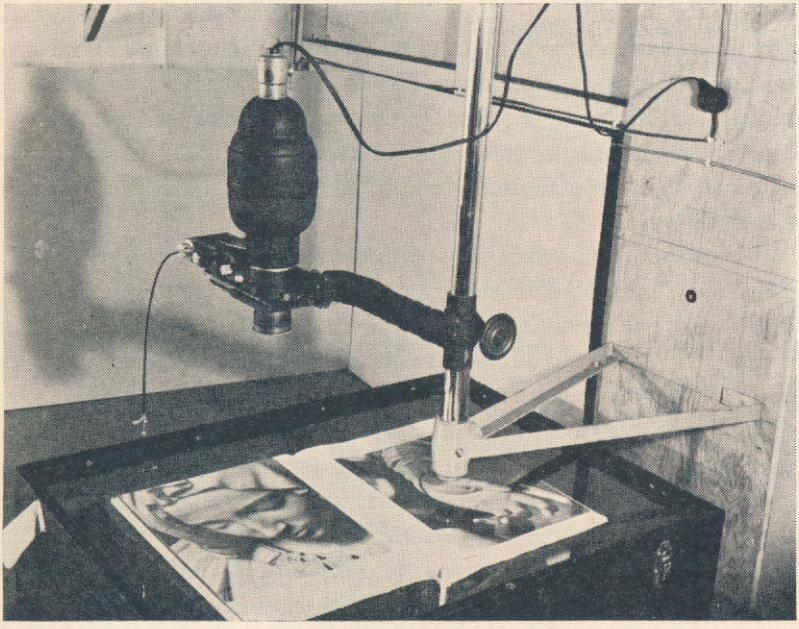

FIG. 1.—Leica Camera Adapted for Rapid Focusing
Philadelphia Museum of Art

lens remains fixed, while on a sliding track above, either the camera or the ground glass may alternately be centered over the lens.

But rather than focus directly on the ground glass, we have mounted a lamp house and condensers over it, and provided a target, consisting of a small round spot of India ink with fine jagged needle scratches across it, on the ground glass itself. The ground glass has been further masked to exactly the size of a square-cornered Leitz slide mask rather than the slightly larger size of the image on the film. Then, with the room darkened, and the lamp house over the lens, the camera is focused in the

same way as an enlarger: the lamp projects a rectangle of light governed by the masked ground glass, which will exactly indicate the area of the original which will be photographed. When the scratched lines in the target are sharply projected, the lens is in focus. With one hand, the operator can move the lamp and camera up and down the pole to get the right size while with the other hand he adjusts the lens barrel to keep the target in the center of the illustration to be copied in focus. Our lamp house is the body of an ordinary bedside spot reading lamp, with an ordinary 100-watt lamp. The ground glass frame has a bayonet mount, so the lamp house is easily removed if, as is the case when copying very small illustrations, the target becomes too small to see clearly, and a magnifying glass must be used to focus on the ground glass in the usual way.

One constant annoyance, in copying a variety of sizes with the regulation Leica lens, is the necessity for changing tubes to obtain sufficient extension. If the lens is constantly used with the barrel unlocked so that it will slide in and out to focus, the barrel fitting eventually becomes loose and worn, and the lens consequently out of plane or even loose enough to be moved by the slight vibration caused by moving the camera over into position. We have remounted our lens barrel so that triple extension from about 60mm. to about 110mm. is possible without the use of any tubes. The original lens mount has been cut down and refitted on the inside of an additional two-part threaded barrel. The sliding and locking feature of the original barrel has been retained, but so as to operate not from the front of the camera, but from the front of the additional threaded barrel. So, with the original barrel locked in, and the threaded barrel screwed all the way up, the lens is in focus at about 32 inches. By unscrewing the threaded outer barrel, with the original barrel remaining locked in, the range of focus from about 32 to about 9 inches is covered, corresponding to a double extension of the bellows. If it is necessary to work still closer, a triple extension is gained by now pulling the original barrel out and locking it, making the close adjustment with the threaded barrel. The quadruple thread is naturally steep, so that only 2½ turns make a full extension. Originals from 16 x 24 inches to 1½ x 2¼ inches may be copied with this assembly, and this covers all the normal dimensions of photographs and illustrations in books. Smaller originals

can be copied if the regular extension tubes are used; by using another Elmar lens in the standard mount, material larger than 24 inches on the long dimension, up to about 3 x 4½ feet, can be copied.

Most ordinary material can be copied on test runs at a rate of one exposure per minute. This is a great increase in speed over the fastest work possible with the regular Leica assembly, considering that each frame must be individually placed and focused. In actual practice over a period of weeks, we can photograph one roll of 32 lantern slide negatives per hour, including all time spent loading cartridges, keeping records, and all operations. The Princeton camera, much more elaborate than ours, hut intended for the same work, cost in the neighborhood of $1000, I believe; the auto-focus Leica was to sell for over $900, but only one assembly reached this country; the nearly automatic Recordaks, in various assemblies, are very expensive. Our camera, complete, cost us about $160.

The bookholder which we use is a free translation, by the museum's cabinetmaker, of the Folmer bookholder supplied for use with the Photo-record camera. It is a box with a hinged glass top containing a double-leaved cradle which is pressed up against the glass top by springs. An ingenious screw arrangement, devised, from a shoe stretcher, by Hugh Graham, present head of the photo-laboratory, controls the pressure on the center har to which the leaves are hinged. A three-way electric switch individually and successively lights the focusing lamp, the taking lights, and an over-all working light.

The mechanical adaptations were made for us partly by Mr. Howard Small, a skillful Philadelphia camera technician, and partly by Mr. Edward Kasten, of the Physics department at Swarthmore College, who built the Princeton camera.

The standard five-foot length of film is well suited to our purposes, as our pace is set neither by the camera nor the darkroom, but by preparations, cataloging, individual hinding and filing frame by frame. Twelve hundred to 1500 exposures per month is about right for our small staff of four persons. Not unless we had a staff of a dozen typists and binders to keep busy would longer rolls of film he an economy. As it is, we have considerably speeded up operations hy making negatives which can be turned into positives on a continuous printer, an entire

five-foot length at a time. Remember that these are all continuous tone negatives, often from a variety of sources, and that this material usually has to be printed one frame at a time.

All lantern slide negatives are made on Eastman regular safety positive film which, we find, has a sufficient scale of gradations for our purposes. Thirty-five mm. negatives which are to be enlarged for exhibitions, as well as printed for lantern slides, are made on Eastman Microfile film.

The standard exposure was determined by exhaustive tests on a picked lot of originals, including on the same film all possible black-and-white tone ranges. The lights naturally are fixed: six 100-watt bulbs giving illumination on a white card in the position to be copied of Weston 13. All negatives on one roll are printed alike, for the same time, on a Stineman continuous printer. Since the potential scale of the film is greater than the scale of the originals, and the exposure and development are based on a middle grey, it is entirely possible to photograph black-and-white line work, high key, low key and full range original material on the same film well enough for practical lecture purposes. The situation is much as though we had to copy an original photograph, one half of which, in full light, shows high light detail with very contrasting blacks and the other dark half, presents delicate shadow detail, and then had to cut the resulting straight print in half for use as two separate pictures. Technically, we see no difference between the exposure necessarily given to one picture to be copied as a whole, and the exposure to be given to the same picture cut into several pieces and copied separately with the same lens extension. If we can copy the whole so that a satisfactory straight print can be made, can we not copy the light and dark portions separately so that identical printing times will give equally good separate prints? We are simply treating a whole roll of film as though it were one picture. We can do this in flat copy with fixed even illumination, but we could not with three-dimensional objects and cast shadows. The only variation in exposure needed is that required to compensate for the change in effective lens aperture resulting from barrel extension.

Our exposure instructions, mounted beside the camera, therefore, call for 8-seconds exposure at f/6.3 for distances over 22 inches; 9 seconds

between 22 and 11 inches, and reading from a scale which translates lens extension directly into exposures from 10 to 29 seconds for distances less than 11 inches. Exceptions are necessary for copying material printed in brown ink or when using extra sheets of plate glass in the bookholder to make difficult bindings lie flat against the upper surface.

For this argument, its testing and application, I am indebted to Spencer B. Fulwiler of Philadelphia. I have emphasized the principle because of the time and trouble which it saves. Photographic technicians seem to be horrified, but we are making these slides for lecturers and they are delighted. They want a lot of slides and they want them quickly and cheaply.

The conventional way of working with the regular Leica copying device involves opening the lens to focus each time, then stopping it down to expose. With our lamp to project a target, we can see to focus clearly at f/6.3. The device is extremely accurate, and this aperture is sufficient for the depth of field needed. We found that much more allowance for possible error was necessary when focusing on the ground glass, even with a magnifier. There is an immense saving in time when the diaphragm opening remains fixed and the exposure is so simplified. The time is spent in finding the place in the book to be copied, getting it flat, and sundry other nonphotographic operations.

Our present cameraman, when he started work, knew nothing whatever about photography; he came from the WPA staff which was binding slides. After 15 minutes of instruction, he independently produced a perfect roll—and all his subsequent rolls have been perfect, except for a few things which were not his fault. There have been some fogged frames due to leaky cartridges, and a few numbers have been confused, but there has been nothing to interrupt a steady flow of work, day in and day out. When a project involves WPA workers, foolproofing which makes such a record possible is an extremely important factor.

Development of negatives is likewise standardized: 4 minutes in a Nikor tank, 2 reels at a time, with continuous very gentle agitation, at 70 degrees in Eastman D-76 maintained at constant strength by a regular schedule of partial renewal and replenishment. Positive prints are made for us by a local commercial establishment for 35 cents for each 5 feet of film. Before delivery to the printer, each roll of negative is tested for

density by putting it in a 35mm. enlarger and reading the blackest portions (usually white margins) with a Haynes Photometer. At a constant lens aperture and lens to easel distance, the reading is made with the paper speed indicator set in the center at 55. Density readings on the negatives we now regard as standard vary from 40 to 50 seconds, though in experiments we have had negatives varying from 25 seconds to 1 minute 40 seconds. These readings are made into a list which goes with the negatives to the printer, who translates these figures by a scale of his own into his exposures, controlled by the rheostat on his Stineman machine. He gets perfectly satisfactory results without any test strips, though these were of course necessary at first, before standards were established. We have not found it possible to produce negatives of unvarying density from lot to lot. The deficiencies of this unscientific method of testing are obvious but it seems to be the best available and it works well enough for our purposes.

We built a printing frame to print by contact an entire 5-foot length of film under a row of overhead lights, but were consistently plagued by Newton rings. Lack of time has prevented the development of better apparatus for contact printing in our own laboratory, though we think this is possible by printing only 12 or 18 inches at a time between special anti-Newton ring glass and a pneumatic cushion. For the latter suggestion I am indebted to Vernon Tate. The same method of testing would probably result in our being able to make contact prints in quantity without test strips. When we started to streamline this project, the operators were making individual contact prints, with a high percentage of errors, and at a very slow rate.

We make only 32 slide negatives on a 60-inch strip of film. The first frame shows the inclusive serial numbers, which serve both for negative storage and positive slide identification. Three frames are in reserve for possible retakes, extras, etc., but they are rarely used. Each lot of 32 originals is accompanied by an order sheet showing serial numbers, sources, purpose, urgency and remarks. This order sheet, corresponding to a roll of film, follows the negative through the processes, serves as a guide in binding, and finally is filed as the negative inventory. Rolls of negatives are stored in simple drawer cabinets in small cans on the tops of which are written the inclusive serial numbers which also ap-

pear photographed on the film. Reference to the negatives is made from the card catalog of the finished slides.

The catalog cards are transcriptions of the captions given in the books copied, or, if that is inadequate, of captions written out by the selector. By using quite thin stock and special carbon paper, it is possible to typewrite two cards at once. The carbon copies can be fixed, if desired, by dusting with talcum powder and a wad of absorbent cotton. At the bottom of both cards appears the source from which the copy was made and the classification code symbol. In the case of books it is not necessary to give a bibliographical note as source; a serial number, which can be identified by the library catalog, and a page or plate number suffice. If the book is not in the library of this museum, but there are many slides from it, a number is assigned that title, and a card, showing ownership, inserted in the catalog. Titles of periodicals are usually written out. If the book belongs to this museum, a small rubber stamp showing that a slide negative has been made, with the year, is impressed in the margin of the illustration, so that the books in some measure serve as an index to the slides. If the slide is of an object of art in this museum, the cards are usually made from the official Registrar's file, and show the identifying accession number with the name of the museum. Names of owners of objects of art appear on the cards whenever possible.

The original card, called the control card, is filed by serial number, and is followed by another card bearing the same number which is used for charging the slides to borrowers. The control cards are punched at the bottom and held in their trays by a rod which passes through the hole, but the charging cards have a slotted hole, so that they can be withdrawn to write in names and dates. The carbon-copy cards have the serial number stamped in the opposite corner, and are alphabetically filed by subject. The slides themselves are classified. The cards are alphabetically filed in some way different from the classification, so as to provide a variety of approaches to each subject division. Architectural slides, for instance, are classified by country, but the corresponding cards are alphabeted by name of city whenever this is practical. Classification must be extremely flexible in interpretation—no rigid system will work. The classification used here was devised by the writer, and is substantially

the same in outline as that used for shelving books in the library, though quite different in subdivision.

.1 Ancient archaeology, inclnding Pre-Columbian America
.2 Medieval art and archaeology, all arts and countries, including decorative arts, armor, illuminated manuscripts
.3 Oriental art, including Islamic art; and Ethnological art, including American Indian
.4 Architecture, Interiors, Decoration and Furniture, in Europe and America, 15th to 19th ceuturies (with some 14th century material), arranged by country and style
.5 Decorative art objects (ceramics, metalwork, textiles, etc.) in Europe and America, 15th to 19th centuries, arranged hy craft
.6 Sculpture, Prints, Drawings and Paintings, European and American, 15th to 19th centuries, which cannot be alphabeted by name of artist, arranged by period, hut not hy country, within each of the four divisions
.7 Modern art (the "advanced" movement, which we redefine as we go along) including Industrial art, Engineering, Photography, Cinema, and explanatory source material
.8 All art, European and American up to the beginning of Modern art (Cézanne, in painting, in our interpretation) which can be arranged in one alphabet by name of artist: sculpture, painting, prints and drawings together regardless of period or country
.9 Miscellaneous classes in alphabetical order

The notation is entirely in decimal fractions. Slides are filed in tarboard hoxes which we made here, to fit on standard 12-inch shelving. Within each class, the slides are arranged by serial number. Further subdivision can be made as required and the subcode indicated on the control card.

We use slide masks folded with the metallic foil inside, to allow the greatest area of paper for typing and numbering. On each slide, there is the following:

1. A serial number, which is also the negative serial number and which also appears on the photographer's order sheet, and on the index and control cards. The slide can always be referred to by this number. It should not be a classification number, since the latter should be subject to change without extracting and changing lists and records. The numbers are printed with a mechanical lever movement serial numbering stamp.

2. A short caption, omitting all information obvious from the picture itself, limited to names, dates, places. Two lines each of 18 Elite typewriter characters will go in the margin of a 2 x 2 inch mask. This is sufficient for most practical purposes. The slides should be arranged by numbers, not by captions, excepting in certain alphabetized classes (e.g., class 8).
3. A classification code number written in pencil on a small gummed label on the outside of the glass, on the reverse side from the caption and serial number, where it can be changed, when revision is necessary.
4. A thumbmark (small gummed disk) to guide the operator in putting the slide right way up in the projector.
5. The name of this museum rubber-stamped.

Color slides are bound in red tape; black-and-white slides in black tape. Cards for color slides are prominently rubber-stamped to this effect.

In routine procedure, the selector inserts markers in books or otherwise indicates material to be copied. The classifier then marks the classification code on the book markers. A typist prepares cards and order forms, and stamps serial numbers on cards, order sheets, masks and bookmarkers. A reviser underlines on the cards the abbreviated caption to be typed on the mask. Control and subject cards are filed forthwith, before the slides are made. Books and order sheets go to the photographic department, and finished masks to the binding department. Rolls of finished positives are then matched by number with the masks (the order sheets indicate any irregularities) as they are cut up. Finished slides are checked in on the control cards, and the class numbers copied on to the slides from the cards. Slides and catalog are then ready for borrowers. Service is in charge of the Division of Education, under the direction of Mr. E. M. Benson. Rental charges are one dollar for any number of slides up to 100 and one dollar for a projector. We have produced about 8000 slides so far, mainly since September 1, 1941.

The following is an account of costs for producing 1000 slides in black and white by this method:

Film for negatives, 160 ft.	$ 2.44
Chemicals, approximately	.50
Positives, commercially printed, at 35 cents per roll	11.20
Catalog cards, charging system, guides, etc.	3.80
Glass, 2000 pieces	24.00

Masking tape, 75 yds.	1.35
Binding tape, 225 yds.	4.20
Masks	4.00
Investment on equipment ($1000 in equipment good for 100,000 slides)	10.00
Filing boxes	.80
Labor: Administration, classification, filing, developing—60 man-hours at $1.60	96.00
Labor: Typing, marking, photographing, binding—250 man-hours at 73 cents	182.50
	$340.79

Usual cost estimates on slide production do not cover such items as administration, cataloging, equipment, etc. The last figure represents WPA labor, partly at low efficiency, without adequate supervision. The potential speed is about twice that indicated, under different conditions. If the materials only are considered, these slides cost us $.0525 each rather than $.34. The actual cost to the Museum, leaving WPA funds out of account, is about $.16 each for black and white and $.252 for color slides.

Microphotography and the Public Records*

VERNON D. TATE

In a complex civilization, involving more than thirteen tens of millions of individuals no two of whom do exactly the same things or live in precisely the same manner, the Federal Government, as the largest corporate entity in the United States, forms the framework or cohesive factor which has served to merge a heterogeneous mass into a nation. A collection of its records is one of the most valuable assets which a nation may possess. Information about past policies, achievements, mistakes, progress, in fact the total wealth of national experience extending beyond the memories of living men, forms a resource of incalculable value. This fact was appreciated by the founders of the new United States; in 1791 Thomas Jefferson wrote to Mr. Hazard as follows:

I return you the two volumes of records, with thanks for the opportunity of looking into them. They are curious monuments of the infancy of our country. I learn with great satisfaction that you are about committing to the press the valuable historical and state papers you have been so long collecting. Time & accident are committing daily havoc on the originals deposited in our public offices. The late war has done the work of centuries in this business. The lost cannot be recovered; but let us save what remains: not by vaults and locks which fence them from the public eye and use in consigning them to the waste of time, but by such a multiplication of copies as shall place them beyond the reach of accident. This being the tendency of your undertaking be assured there is no one who wishes it a more complete success than, Sir, Your most obedient & humble serv.

(signed) *Thos. Jefferson*[1]

* Paper presented June 23, 1941 at the joint meeting of the American Library Association Committee on Photographic Reproduction of Library Materials and the Association of College and Reference Libraries.

[1] This letter was brought to the attention of the writer by Dr. Julian Boyd, Librarian, Princeton University, who published it and circulated a number of reprints. It is here reprinted through the courtesy of the owner, Mr. Spencer Hazard.

With the appearance of microphotography and its manifold advantages as a record preserving medium in many fields, it was logical to assume that sooner or later the Federal Government would become vitally interested. Actually, there are three great general fields for microphotography—namely, academic, business and industry, and government. Chronologically speaking, the first of these to experiment was the academic. Early academic projects utilizing microphotography, fumbling as they now seem to us, were important, and paved the way for the development of new equipment and new processes which in turn stimulated wider application. So it was barely more than a decade ago that a new set of circumstances enabled business and industry to apply microphotography to many problems, measuring its value in terms of the universal business yardstick—savings in dollars and cents. At the same time, the infiltration of microphotography into business brought new life to academic usage and stimulated the adoption of the technique in the third great field, namely, the Federal Government. Over thirty governmental agencies are now actively engaged in microphotographic projects embracing virtually all well-known applications. In many instances the Government has assumed the initiative and developed new techniques and equipment for specialized purposes. Through the activities of its agencies the Government embraces many of the usages of microphotography common in the academic, business and industrial fields. Therefore a review of microphotography and the public records requires consideration of these fields.

Some of the advantages claimed for academic microfilming include:

1. The acquisition of rare or unique documentary originals, or the exchange of such material,
2. Reproduction for preservation or perpetuation to insure the records against damage from any contingency, or because the originals are on impermanent stocks, or to guard against their destruction through intensive use,
3. The inventorying of collections and the compilation of catalogs,
4. The saving of storage space.

All of these benefits and many others are being realized by Governmental agencies. For example, ten years ago the Library of Congress reproduced about a million pages of material, relating to American his-

tory, in the principal archives and libraries of the world. Some of the originals have now been destroyed, and the wisdom of facsimile reproduction has been amply justified. Currently, microphotography is being used for a purpose diametrically opposed in intent to the European copying plan; field offices of several agencies are being provided with copies of material which cannot be procured in the original. The Historical Division of the National Park Service supplies its regional offices with microfilm copies of manuscript, printed material and maps for use in research work. The regional offices are likewise equipped to microphotograph unique or rare materials available in their localities for transfer to the main office in Washington.

Wartime congestion of office space and living quarters for personnel have dictated the decentralization and removal to other localities of agencies in Washington not immediately concerned with the National Defense. Some have already been moved and others are scheduled to leave as soon as arrangements to receive them in other localities are completed. It is relatively easy to move office furniture and accessories, but records and files are another matter; numerous problems arise. What records should be moved, destroyed, transferred or stored? Should files be split, and if so how can indexes be divided? These are only a few of the problems confronting administrators. Microphotography has implemented solutions in several instances. Records or working papers, too bulky or not valuable enough to be moved, have been microfilmed for current use in this form; indexes and other finding media have been microfilmed in quantity. In several instances valuable records intended for transfer have been microfilmed to safeguard them against possible loss or damage in transit. A few years ago an agency moved its headquarters to New York from another city. At the time interstate truck drivers were on strike, and certain of the trucks carrying records became involved in a demonstration. Several were overturned and some records were never recovered. Fortunately, they had been placed on microfilm, and the film files were used to replace the original papers.

To preserve record materials that are on impermanent bases several agencies regularly microcopy mimeographed and hectographed material, press letter books, and even machine punch cards. The Library of Congress and the WPA are engaged in newspaper microphotographic

programs for preservation on a large scale. Some valuable records are likely to be worn out through handling and intensive use. The Bureau of the Census, for example, has received innumerable calls, sometimes as many as 2000 a day, for searches to be made of the census schedules to determine old age, or residence for old age benefits, or for Alien Registration. The original ponderous census schedules are awkward and difficult to search, and excessive handling was rapidly destroying them. Almost a century of American Census schedules have now been placed on microfilm for preservation.

Inventorying and cataloging by microphotography have been used to duplicate and make available in many locations valuable catalog files ranging into millions of units. At The National Archives 2,600,000 index cards were microphotographed, and have been in daily use for the past four years. The catalog of the Forestry Library has recently been completely filmed. Microphotographic inventories of museum collections are not infrequent. The reduction in bulk to save expensive storage space is a vital problem which will be considered in detail later.

But what of the business applications of microphotography in filming bank checks, personnel cards, application forms, legal documents, insurance records, engineering materials, or medical records of varying types? There is probably no greater consumer of microphotography in each of these fields than the Federal Government. The Treasury Department has many microphotographic cameras engaged in filming bank and treasury checks of all types and descriptions. Personnel cards and records, including application and other forms, are microphotographed in profusion by a growing number of agencies. The largest personnel center in the country, the United States Civil Service Commission, has adopted microphotography for certain of its records. The Social Security Board has made microphotography an integral part of its gigantic organization for social welfare, even going so far as to make duplicate microfilm records of some of its most important documents for preservation. Legal documentation is being microfilmed by many agencies, among them the Securities Exchange Commission, the Department of Justice, and the Wages and Hours Division of the Department of Labor.

It has been possible to effect great savings in fiscal and tax accounting fields through the use of microphotography. Where, for example, a corps

of trained examiners would require weeks or even months to examine the records of a manufacturing plant or a business firm in the field, it is now possible to microfilm and transfer the records to a central point for intensive study by a smaller home office staff which is more efficient and requires no per diem expenditures. In some cases records which might have been impounded in court for long periods of time have been microfilmed, and thereby made available for continued use. Engineering drawings, maps, blueprints, specifications, and similar materials are being filmed in quantity by several agencies. The Public Roads Administration is filming the blueprints of its public roads projects. Some of these activities are concerned directly with the National Defense program, and it is not possible at this time to elaborate on the details. After the period of the emergency is past, however, several unique and valuable usages will be disclosed.

Probably the greatest single governmental microphotographic activity may be considered under the general term of "record preservation." Many of the projects previously mentioned deal partially or exclusively with record preservation. In general, programs may deal with current and noncurrent materials. The current materials may be subdivided into categories of permanently valuable papers, papers which are valuable for a given period of time, and papers which have immediate but no future value. Noncurrent records may also be considered in terms of value or activity; that is, whether they are active, semiactive or inactive. The age of a document is no criterion for determining activity. In the sense of being read or looked at by many people, the Constitution of the United States is probably one of the most active documents in the country; at the same time, it is one of the oldest in our national history. The evaluation of records for disposition is a function shared by the respective agencies and The National Archives under the terms of an "Act to provide for the disposition of certain records of the United States Government (approved August 5, 1939, 53 Stat. 1219–1221)." It has proved practicable in many cases to dispose of hundreds and even thousands of tons of duplicate copies, filled-in forms, tickets, slips, and similar minutae, but the residue still amounts to a staggering figure. In Washington alone, it has been conservatively estimated that 4,000,000 square feet of floor space are used for the storage of records of one type or another. The Na-

tional Archives could not contain them all and the increment, especially at the present accelerated rate, is tremendous. It would not, in fact, be desirable to retain all records. Some obviously must be retained; others, equally obviously, should be destroyed. There is a median ground, however, wherein documents may not be of sufficient value to preserve, but, informationally speaking, are too valuable to destroy. At the same time, their very bulk may compel action. It is here that micriphotography is rendering a great service to the Government.

On September 24, 1940, Congress approved an Act to provide for the disposition of certain photographed records of the United States Government, and for other purposes. This Act reads in full as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever any agency of the United States Government shall have photographed or microphotographed all or any part of the records kept by or in the agency in a manner and on film that complies with the minimum standards of quality approved for permanent photographic records by the National Bureau of Standards, and whenever such photographs shall be placed in conveniently accessible files and provision made for preserving, examining, and using the same, the head of such agency may, with the approval of the Archivist of the United States, cause the original records from which the photographs or microphotographs have been made or any part thereof to be disposed of according to methods prescribed by law, provided records of the same specific kind in the particular agency have been previously authorized for disposition by Congress.

Sec. 2. Photographs or microphotographs of any record photographed or microphotographed as herein provided shall have the same force and effect as the originals thereof would have had, and shall be treated as originals for the purpose of their admissibility in evidence. Duly certified or authenticated copies of such photographs or microphotographs shall be admitted in evidence equally with the original photographs or microphotographs.

Approved, September 24, 1940.

The two sections of this brief but potent legislation are of tremendous significance. It should be noted that the National Bureau of Standards was directed to enunciate minimum standards of quality for microfilms approved for permanent records. These standards are as follows:

Films for permanent record use should be of the cellulose acetate type sen-

sitized with a gelatin-silver halide emulsion. After processing, the films should be thoroughly washed to remove residual chemicals, particularly hypo. The film base should satisfy the following requirements:

Flexibility. The original sample, conditioned at 65 per cent relative humidity, should stand at least 16 single folds in the Pfund tester without breaking.

Film aged 72 hours at 100° C. and conditioned at 65 per cent relative humidity, should not lose more than 20 per cent in folding endurance of the original sample.

Acidity. One gram samples of film; original, and aged 72 hours at 100° C., are dissolved in 100 ml of acetone containing 10 ml of water and the pH of the solution measured with a glass electrode. The pH of the original sample minus the pH of the aged sample should not exceed 0.5.

Relative Viscosity. One gram samples of film; original, and aged 72 hours at 100° C., are dissolved in 100 ml of acetone and the time of flow through an Oswald viscosimeter determined at a constant temperature. The loss in relative viscosity caused by aging should not exceed 5 per cent.

Nitrogen Content. The film base should not contain more than 0.15 per cent nitrogen as cellulose nitrate. The determination for nitrogen is made by a modified Kjeldahl method.

On the practical side it would be exceedingly difficult, if not impossible, to test each film used by a Government agency for compliance with these specifications. Accordingly, an agreement has been reached with the principal film manufacturers whereby they have agreed to manufacture a special film to meet these specifications. Samples for test and approval will be submitted, periodically, and if approved the product will be branded "Approved by the National Bureau of Standards for permanent records" and given a distinctive edge fogged symbol.

There is more, however, to the making of permanent microfilm than the film base and emulsion. The film must be satisfactorily processed, and remain free from scratches, blemishes, breaks, abrasions, or other mechanical hazards. The maximum permissible hypo content is .005 milligrams per square inch of film as determined by the Ross-Crabtree or the Crabtree silver nitrate test. By arranging for a supply of film of known quality, and by providing suitable tests for processing, the National Bureau of Standards has helped to place microphotography on a firm and scientific foundation.

Section 2 of the Act of September 24, 1940, providing that suitably authenticated microfilms shall he treated as originals for the purpose of their admissibility in evidence, is another highly important foundation stone in determining the legality of microfilm copies.

The practical application of microphotography to the public records on a large scale has resulted in the emergence of certain facts which might not have been evident for a long time if use of the microphotography had not been contemplated to replace valuable original records. In the first place, microphotography has become a substitution medium. In other words, the information contained in ink on paper documents is transferred to metallic silver, on film, which is basically cellulose. This medium is not the same as the original paper, and while it offers great potentialities it also possesses certain inherent characteristics which must be considered in formulating a program. Some of these are as follows:

1. Files should be in order before being filmed. It is exceedingly difficult, if not impossible, to refile material once it has been placed on microfilm. Time and energy spent in prior rearrangement will be amply repaid as the documents are used.

2. As the records are being microfilmed, they must be carefully certified in order to preserve their legal entity, and in order to permit them to be admitted without question in conrt as evidence.

3. Microfilm negatives of records which have permanent value and which are to be preserved indefinitely must not be used for consultation in reading machines, but only for the production of duplicates, either positive or negative, for such use. If this is not done in the course of time, the records themselves will be destroyed.

In the light of the foregoing, the need for careful planning and a complete understanding of the technique are evident. Microphotography in the Federal Government has assumed gigantic proportions. A technique of organization and application is growing up which will enable methodical and orderly microphotographic reproduction of records, and which will insure their preservation for the future. Applications are manifold and microphotography is gaining acceptance by reason of its advantages and savings. It plays a vital part in consolidating, defending, and perpetuating our way of life and our civilization in a world that is shaken to its very foundations by unrest, war, and destruction.

Suggested Materials to Be Filmed for the Use of the Historian

WILLIAM THOMAS MORGAN

THE AMERICAN HISTORICAL Association owes a lasting debt of gratitude to Professor E. L. Erickson for his labor of love upon the British Blue Books, as well as for the highly informative paper on microphotography which he read at one of its sessions December 29, 1941.[1] But if the work so auspiciously begun by him and Dr. Herbert Kellar, Director of the Experimental Division of Library Cooperation of the Library of Congress, is to bear fruit, it is highly essential that a subcommittee of the Association's present Committee on Historical Source Materials be provided at once to collaborate with similar groups of the Modern Language Association, the American Council of Learned Societies, and the Library of Congress. It is vitally necessary that there should be not only a wise selection of material to be filmed but also, if such materials are to have their maximum utility, most of the film strips must be carefully edited, with information as to the location of the collection, its general condition and accessibility.

While disclaiming any desire to portray the role of the raven at the feast, the writer must confess to less optimism than Dr. Erickson as to the future of library cooperation—librarians and professors, even professors of history, being the individualists they are. We may be certain, however, that librarians and archivists will cheerfully serve the most pressing needs of historians, once the reasonableness and urgency of such needs are made clear.

Upon accepting the invitation to prepare this paper, the writer asked several of our leading librarians and professors of history to suggest source materials of a rather general interest in the various fields of history that might profitably be filmed for scholarly research by professors and graduate students. The response was, in the main, highly gratify-

[1] To be published in March 1942 *Journal*.—EDITOR.

ing. While these replies were coming in, the JOURNAL OF DOCUMENTARY REPRODUCTION was consulted. Its perusal provided a concrete and highly impressive illustration of what whole-hearted teamwork among scholars can accomplish, and amazed the writer by its revelations of the progress already made in microphotography, especially on the mechanical side.

Dr. Kellar's Committee for microfilming materials in foreign archives has already ordered some 25 millions of pages to be filmed. This is only a small installment of what the Committee hopes eventually to accomplish with adequate support, financial and moral. Unfortunately, only a small fraction of the films has yet reached the Library of Congress. It may happen in this case that the race will be to the swift. Filming valuable materials in British country houses and in other scattered places is an exceedingly wise step, for the dispersal of much of this material at the end of this war is almost certain. However, many scholars can well testify to the difficulties encountered, as well as the time and expense involved, in gaining access to some invaluable collection. Twice the writer was granted permission to use some important papers in an English country house, but the owner and he could never agree upon a suitable time. Another English gentleman once invited him to be his guest and make use of a very unusual collection of official documents. At least three weeks were needed to make much headway with them, but the writer left in as many days for fear of outstaying his welcome. Again, on the last day of the writer's stay at one of the better-known Continental archives more than a decade ago, the alert and obliging curator finally uncovered five large boxes of letters dealing specifically with the subject under investigation! It has since been impossible for him to return to these treasures; and to secure written copies or photostats of these pertinent sources was well beyond the researcher's means. For more than a dozen years another historian has been collecting the correspondence of the Marquis de Lafayette. His ambitious task would have been rendered much less difficult, less expensive, and less time-consuming, if he could, in the earlier years, have made use of films.

On the single topic of British elections, in which the writer is deeply interested, there are at least three unpublished volumes in private hands: one covers all the constituencies from 1295 to 1918; the second is a bio-

graphical dictionary of members of Parliament from 1485 to 1708, complete from A to Lo; a third contains biographical, genealogical, and official notices of M.P.'s from 1707 to 1832.

A year and a half ago the Library of Congress reported that it had acquired over three million pages of films and photostats, copies of much of which could be purchased or borrowed. In recent years our National library has also filmed many of the most valuable historical treasures of Hispanic America, and is considering the filming of much of the Herndon-Weik Collection and other rare Lincolniana. It is at present expending $40,000 a year for microphotography. Most of the great American libraries are willing to film their rarer items at a reasonable cost. Professor C. W. Ramsdell and Mr. and Mrs. Barnes Lathrop have provided at the University of Texas a great storehouse of materials on Southern history, which may be drawn upon by interested scholars as needed. Professor R. B. Morris' recent article on "American Court Records" suggests to scholars in other fields the necessity of preparing a similar program.

As Mr. Ralph H. Carruthers of the New York Public Library noted recently in the September 1940 JOURNAL, the problem of selecting material is the knottiest one we have to solve in the field of microphotography. Moreover, it is also in many ways the most fundamental. Somehow we must find a happy medium between wholesale copying and exhaustive (as well as exhausting) selection. In the present world cateclysm the program should be, as Mr. Carruthers happily phrases it, something between a rescue expedition with Father Time at our heels, and a thoughtfully considered, methodical crusade in search of indispensable source materials to he filmed for scholars in the various fields of study.

Into the perplexing problem of accessibility of the originals to be filmed we cannot enter, for once the desirability of filming particular materials is accepted by Dr. Kellar's Committee, it becomes the group's task to see that permission can be secured to photograph them. Among items apparently of equal importance, preference should be given to materials in a bad state of preservation or poorly housed.

The greatest attention so far in microphotography has been paid to newspapers, due partly to availability, and partly to the necessity of conserving space and of preserving from total destruction those papers of the

dreadful wood-pulp era. The Recordak Corporation will furnish a complete file on film of the indispensable London *Times* for $6,750. A microfilm company is marketing a set of early American newspapers at less than $500. Harvard began filming nearly forty foreign newspapers a year before the war began. The New York Public Library has filmed the *New York Call* and the *People;* Yale, the *Maryland Gazette;* and the University of California, the *Southern Literary Messenger* and the *Golden Era.* All such work is certain to be cumulative. A few years ago an expensive photostat edition of Defoe's immortal *Review* appeared. A clamor immediately arose for a complete analytical index to it, which, we are informed, is now being prepared. This index will almost certainly bring an insistent demand for filming the rarer pamphlets mentioned in the *Review.*

Some scholars in the field of ancient history are not particularly enthusiastic over the future possibilities of films in their research. Papyri apparently do not lend themselves well to photography.[2] One professor suggested, however, filming several hundred dated papyri, carefully selected from British collections, to provide students with a manual, by whose help they might learn how to date most of the papyri they would encounter. He also added that he thought that the demand for such a manual might justify a microprint edition. Some medievalists likewise are not greatly interested in films of manuscripts, although fully recognizing their great value for early prints, incunabula, obscure periodicals and monographic materials. They prefer to work from photostats, particularly when an intensive study of text of a document is necessary. One student of medieval history recommended filming the more significant romances in manuscript in the British Museum. Another student recommended filming all Greek manuscripts of the 12th century or earlier. He estimated that there were not more than a million leaves in all, of which only a small fraction were in England.

Scholars in American history have made great use of films and photostats, especially those working in Colonial and Southern history. More use will certainly be made of them in the latter field as the rich resources of the Duke, Louisiana State, and the University of North Carolina

[2] Papyri can be microphotographed satisfactorily but usually have been reproduced on larger cameras. A special technique is employed.—EDITOR.

libraries become better known, while in the earlier field the treasures of the John Carter Brown and the American Antiquarian Society libraries could be made more available by means of films. One professor stressed the need for a comprehensive index to Niles' *Weekly Register,* and called attention to the vast amount of valuable material "embalmed" in Government publications, especially maps, land surveys, details about Indian Reservations, etc., which might be recaptured through films. For scholars interested in the history of our Far West, it has been suggested that the H. H. Bancroft Manuscript be filmed, and that a central repository be provided on the Pacific Coast for such films.

Many workers in modern European history have used films very extensively. One scholar has had some 50 diaries of early 17th century England microcopied. The war interrupted his launching of a two-year plan. Another had accumulated 25,000 pages of films of manuscripts on Baltic history, when the present unpleasantness compelled him to flee, leaving his films behind. Fortunately, these have since found their way to the Library of Congress, thanks to the efforts of the American Government. One student of 19th century Europe would have us film the debates of the various legislatures in Continental Europe, as well as some of the leading provincial papers of Great Britain and France.

In the field of modern English history, one scholar recommended filming all the State Papers, Domestic, from Edward VI to James I, to which we might well add those from 1704 to 1720. At least three volumes of one of the more important series of Calendars published by the Public Record Office have been printed but not yet published, and the same thing may be true of other series. These might, perhaps, be filmed. We should, moreover, pay special attention to private collections which were inadequately done by the Historical Manuscripts Commission.

The Bordeaux archives are said to be especially valuable for a study of the Anglo-French wine trade. British Custom House records are also most fruitful sources, as Professor Lawrence Harper has proved. For a study of Anglo-French naval rivalry from 1689 to 1718, we need films of various series in the admirably kept Archives de la Marine (Paris), as well as the local archives at St. Malo, Havre, and Dunkirk, if perchance any of them have escaped destruction. The volnminous Admiralty records in the Public Record Office have been almost untouched,

yet the series of Captains' letters, and the Masters' and Captains' logs are indispensable for the achievements of the Royal Navy. The highly informative minutes of the Navy Board for these years are in private hands, but the owner would probably allow them to be filmed. For our own studies, we should welcome filming the astonishingly rich collection of early 18th century English periodicals. A year ago, the writer published an account of the British election of 1715 based almost entirely upon newspaper files in the Bodleian. Photographing these newspapers should be easy, for we have at least two finding lists. The British Museum and the Bodleian have excellent collections, which could he supplemented hy those at Texas and Yale. Should this suggestion fall upon fertile soil, we foretell that it will he followed hy an insistent demand for films of the more important rare tracts associated with the work of the journalistic "Big Four": Addison, Defoe, Steele, and Swift. But we might go on, asking for films of early 18th century wills, court records of various sorts, etc.

It is well to remind zealous historians of the school of Von Ranke, that most archivists are justly proud of their collections, and are inclined to he slightly jealous of scholars who film their manuscripts by day, and develop these films by night. One European scholar jokingly said to me that if Professor X continued to photograph manuscripts American scholars in his field would no longer need to cross the Atlantic for research in many of the better-known archives.

In conclusion, let mc insist that our emphasis should he placed upon quality rather than quantity. But more important than either are usefulness and accessibility, as any one of you will bear witness who in the earlier days ever tried to work in the esteemed, but never over-illuminated Bibliothèque Nationale. In some way, we must be kept informed as to what films are on order, what orders have heen filled, and catalogs should be made available just as soon as it is possihle to buy or borrow these films. Perhaps all this might be done by a skillful division of labor among the editors of the *American Historical Review,* the *Mississippi Valley Historical Review,* the *Journal of Modern History,* the *Journal of Southern History,* and the *Pacific Historical Review,* and the cooperation of the Library of Congress. And if these things shall come to pass, although it will not be the millennium, yet it will be as near it as the average professor of history will ever expect us to reach.

Dagron's Airgraph Postal Service of 1870

L. BENDIKSON

SEVEN YEARS AGO, I wrote for the *Library Journal* a short story about the Parisian pigeon post service, which was in operation during the Franco-Prussian war of 1870–71. Interest was focused on a demonstration of the durability of microfilm reproductions, by means of a specimen film, made during that war, then 65 years ago. Here we had a film, 65 years old, preserved merely by inserting it into a pamphlet, and still in good condition. Satisfactory enlargements to the size of the originals could be made from this film without much difficulty. This was evidence that we could safely assume that our microfilms were guaranteed to last a century, contrary to the dire predictions of those, who then, as well as now, claimed that we were wasting our efforts by employing this method of reproduction.

By this timely interest in his pamphlet, "La Poste par pigeons voyageurs, Souvenir du siége de Paris," the fame of Prudent René Patrice Dagron, the originator of this method of communication, spread to this continent. In summarizing his pamphlet I had been surprised by its complete lack of technical information although for that reason it was a disappointing document, it had answered its primary purpose—it had delivered to us the inserted film with its caption "Service des dépêches par pigeons voyageurs."

Nevertheless I always felt that information about Dagron's methods would be very interesting; but at the time the article was written, Dagron had been dead for 35 years, and at the old stand, 60, Rue Neuve des Petits-Champs, nothing was known of him. And then a pleasant surprise came from London in the latest wartime issue of the *Journal of the Royal Photographic Society.*

At the time of Dagron's exploits, this society had been duly impressed by the latter's work and in December 1871 a paper from the Parisian

photographer was read before the society and published in the *Journal* of December 14, 1871. An editorial comment referred to this paper as "one of the most wonderful and beautiful applications of the art; and the skilful and rapid manner in which the process was developed calls as much for our wonder as our admiration." But in spite of this well-merited editorial praise, Dagron's paper does not divulge many photographic details, even if it carried the promising heading "On the preparation of Microphotographic despatches on film." One gets decidedly the impression that Dagron is talking against time and saying as little as possible. But after all, he was addressing the most prominent group of photographers of his time and had to mention something besides the historical and adventurous aspects of his undertaking. In his entire pamphlet "La Poste par pigeons voyageurs," he had managed, in 24 pages, to mention only a single chemical, and that merely in order to state that he was badly in need of it; it was "coton azotique." In his paper before the R.P.S., he mentions "pyroxylin" as a chemical that he needed "for photographic purposes."

Towards the end of his paper, however, M. Dagron reveals a few interesting details which can be summarized as follows:

1. He had pledged himself to the French Government to reproduce daily upon film 200 squares of printed matter, each one of 1000 words.

2. The messages were first to be printed in clear type upon sheets of transparent paper, each containing a dozen pages or divisions.

3. The sheets were cut in halves, and each half-sheet placed in contact with a film of dry collodion in a printing frame.

4. In this way six pages of matter were reproduced at one time with an exposure of a couple of seconds, the printing being produced by development.

5. The glass plate was then cut into six portions of one page each, and these were put one after another in the microscopic camera for copying.

6. This camera contained as many as 20 microscopic lenses, so that in two exposures 40 copies were produced upon a sensitive film.

7. The film was subsequently removed from the glass, by means of collodion containing a small proportion of castor oil.

8. On arrival the films were placed between glass, magnified by means of an electric light, and thrown upon a screen. This method was subsequently improved by substituting a sheet of sensitive paper for the screen.

A French proverb advises one to be satisfied with what he has, whenever he can not get what he likes, and therefore we have to be satisfied with the information Dagron has offered us. Nevertheless, we have learned that Dagron's method not only provided his contemporaries with a forerunner of our microfilms, but also provided them with prototypes of our film readers and micro enlargers, in order to enable them to make the best use of his pellicules micro-photographiques.

There is, however, one question that Dagron's paper has not solved. His photographic apparatus is stated to have had an aggregate weight of more than 1300 pounds (600 K.G.), in addition to a complement of apparatus, which was carried in a second balloon. The latter never reached its destination, but even at that, 1300 pounds of photographic apparatus and materials still constitute a surprising profusion for a temporary war-time establishment.

Microphotography and the Joint University Libraries, Nashville

A. F. KUHLMAN

DURING THE PAST five years the Joint University Libraries have depended upon microphotography primarily as a means of acquiring basic primary source materials needed in the social sciences and humanities. The first objective has been to supply members of the faculties at Peabody and Vanderbilt, and M.A. and Ph.D. students with materials basic to their research. Second, an effort has been made to acquire certain materials of permanent value in this regional university center.

The starting point in collecting materials in 1936 was to secure from the U. S. Bureau of the Census film copies of the early census schedules, especially for 1850 and 1860, for selected counties in Southern states. The census films that were obtained from Washington were supplemented later by filming census schedules located at Duke University Library, and at the Alabama Department of Archives and History.

A second line of collecting activities was worked out in cooperation with the Colonial Dames in Tennessee. They made available each year a sum of money which could be used for filming source materials dealing with the colonial period, this being one of the areas of specialization of the History Department at Vanderbilt University. Three types of materials have been filmed with these funds—records of the oldest churches in this area; manuscript collections which originated in this region but which are now deposited in other centers (for instance, the Campbell Collection of approximately 8000 pieces now in the Duke University Library, and the Tennessee and Kings Mountain Papers in the Draper Collection at the Wisconsin Historical Society); and newspapers such as the *Maryland Gazette,* 1745–1820, and the *Knoxville Whig and Chronicle,* 1839–1860 in whose cooperative filming we participated. A beginning has also been made toward filming the *Memphis Commercial Appeal.*

Considerable filming has also been done in the field to aid certain Ph.D. students and faculty members in their advanced research. Thus, Otis McBride used the Libraries' camera and filmed all early records that he could locate relating to academies prior to the Civil War. Altogether approximately 20,000 pages were filmed. Clanton Williams of Alabama also filmed more than 10,000 pages of source materials relating to the history of Montgomery, Alabama. Use has also been made of the film in interlibrary loans for specialized research projects. Dr. George Pullen Jackson, who is studying the origin and early development of Negro spirituals, has made extensive use of films.

As a point of departure, in 1936, a photorecord was purchased, and two Optigraph reading machines, made by the International Filmbook Corporation, were acquired. This camera has been used extensively by graduate students and faculty members in filming in the field. More recently two Argus Microfilm Readers and one Scholar's Microfilm Reader were purchased.

A microphotographic laboratory is being provided in the new Joint University Library building, and occupies an area 30 x 32 feet. The plans and specifications for this laboratory were worked out with the assistance of Herman Fussler of the University of Chicago Libraries. The room and built-in equipment have been completed, and the portable equipment will be acquired as rapidly as plans can be matured.

It is obvious that in such a late-born university center as the regional center in Nashville, we will have to rely heavily on microphotography as a medium for acquiring a great deal of material that is no longer available in the original, and also as a medium by which to acquire sources not available in the commercial market.

Exposure in Microphotography

DANIEL F. NOLL

TRAVELING SCHOLARS with portable microfilm cameras, or photographic technicians in libraries where limited budgets preclude ownership of the more refined microcopying equipment, face problems which are not easily solved by pressing a button and letting a drugstore photofinisher do the rest. This article was prepared for users of the simpler types of equipment, such as the Graflex Photorecord, Argus, Leica and similar portable cameras. It may even be of some value to the users of the more elaborate 35mm. cameras, when the less expensive positive motion picture film is preferred to the special documentary copying film for which the exposure control devices are commonly calibrated.[1] The copying of documents, rather than illustrations or continuous-tone photographs where all the intermediate tones must be preserved in their original relationships, will be stressed.

The camera operator, with some previous experience in general photography, is tempted to use an exposure meter. He recalls the progress in photography made possible by the exposure meter, which enabled many snapshot tyros to graduate into the ranks of advanced photographic amateurs, and may assume that satisfactory exposures for documentary copying can be obtained by measurement of the reflected light and a few turns of the exposure meter's ingenious dial.

There are, however, at least three factors limiting the exposure meter's usefulness which have led most film manufacturers to recommend reliance on test exposures for the more critical problems of photographic

[1] Films without anti-halation backing, such as High Contrast Motion Picture Positive, cannot be used in some cameras where a highly polished vacuum grid holds the film in the focal plane. Light passing through the emulsion and film base is reflected back to the emulsion forming a distinct grid pattern on the negative. In the more expensive documentary copying film the anti-halation backing prevents this. Owners of such cameras who wish to use the cheaper films without the anti-halation backing must coat the polished surface of the vacuum plate with a dull black lacquer to prevent this grid pattern from appearing on the microfilm negative.

copying. The first is the difference between the rated lens aperture, which is based on a lens focused at infinity, and the "effective aperture" which is quite different when the camera bellows is extended for the reduction ratios common in documentary copying. Although the application of the formula for correct calculation of the effective aperture is not difficult, most operators will find test exposures more convenient.

A second factor limiting the exposure meter's usefulness is the necessity for critical exposure required by the comparatively narrow latitude of the films used in documentary copying. In an experiment using a microfilm camera to make student identification pictures of seven different exposures at standard lens apertures with wide-latitude film, six produced satisfactory prints. In the case of some narrow latitude films used in documentary copying, the author's experience indicates that not more than two of seven similar exposures would result in usable microfilm copies.

A third limitation is the variation in intensity of light reflected from pages with different ratios between text and background. Obviously, a closely printed page will reflect less light than a page with more liberal type spacing. Half-tone cuts also decrease the intensity of the reflected light. An extreme case is illustrated by the difference between a photostat negative and positive copy of the same page. An exposure meter over the negative photostat might read 5 foot-candles; over the positive photostat, 30 foot-candles. In spite of these differences in the meter readings, the optimum exposure will be the same in both cases.

If, therefore, the exposure meter must be discarded for the trial and error method of test exposure, the first step for the camera operator is to develop the ability to recognize the optimum density for a microfilm negative. Here again, previous experience in general photography may lead the operator astray. He tends to select as his optimum exposure a negative with a very dense background, whereas in documentary microfilming a less opaque background will result in greater clarity in the text. Exposure should be such that even the faintest text will be transparent without any suggestion of filling-in or fogging. This is especially important in copying manuscript where the density of the script varies with each dip or flourish of the pen. Optimum exposures follow the old photographic rule of exposing for the shadows and letting the highlights take

care of themselves. For the microcopyist this rule might be restated: Expose for the faintest text and let the background take care of itself. The density of the background on the negative depends on the light-reflecting properties of the paper and is beyond the control of the camera operator.[2]

After a word of caution against over-exposure, the next step is to describe a technique for making test exposures. First, select from the material to be copied a page which represents the faintest text encountered; set the diaphragm at a fixed aperture, as for example f/16; make a series of exposures at each of the speeds marked on the shutter. When the text filmstrip has been developed for a standard length of time and at a carefully controlled temperature, it should he fixed long enough to clear the unexposed emulsion and film backing. After a quick rinse in running water to prevent unnecessary dripping of hypo, the strip of exposures ranging from a faint grey to a dense hlack should be examined over a light source with a low-power magnifying glass. The optimum exposure will be the negative in which the faintest text is represented by clear film, free from filling-in or fogging. The exact time used for the optimum exposure may be determined by counting backward from the densest negative. Counting in the opposite direction from the faintest negative is dangerous as the 1/25 second exposure may not have been long enough to form a discernible image. The practice of writing exposure data on a slip of paper to be photographed with the original is sometimes risky as well as unnecessarily time-consuming. In spite of the care taken by the operator, sooner or later he will fail to make the exposure data on the test negative correspond with the actual time of exposure.

The success of the test exposure technique depends entirely on the exact duplication of all factors. The camera should not be located near windows which might introduce variations in light caused by the time of day or the sun going behind clouds. Obviously, the developer, the length of time the film is allowed to remain in the solution, and the

[2] Some improvement in this respect can be made through the use of filters in combination with panchromatic film or in the use of special high-contrast caustic developers. In the author's experience, however, experiments with filters are time-consuming and of only academic interest to persons with limited photographic experience which readers of this article are assumed to have had. High-contrast developers, such as Eastman Kodak Formula D-8, have limited keeping qualities and should only be used where a large volume of film developed daily warrant throwing away solutions at the end of the day.

temperature must be identical. Yet it should be noted that an exposure which is adequate at one reduction ratio may be wholly unsatisfactory at another.

In spite of the emphasis placed on the duplication of conditions, it should not be assumed that the traveling scholar or the library's photographic technician will spend the rest of his life making test exposures. In fact he will soon learn from experience that slight variations from a standard exposure will be adequate for 95 per cent of his microcopying.

The first step is to standardize on one film emulsion, one developer, and a standard reduction ratio. Figure 1 illustrates the film economy pos-

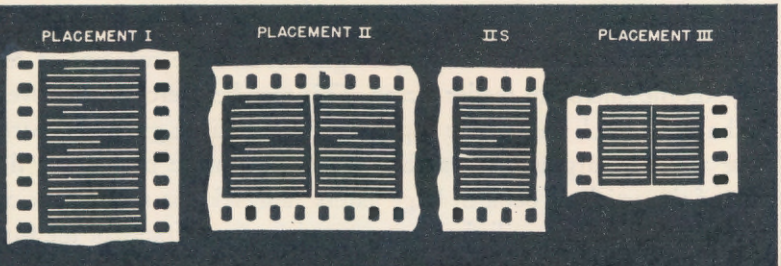

FIGURE 1

FILM REQUIRED AT 12-TO-1 REDUCTION RATIO WITH PHOTORECORD

	I	II & IIS	III
MAXIMUM SIZE OF EACH PAGE	18"X 12"	12"X 9"	9"X 6"
NO. OF PAGES PER 100 FEET OF FILM	800	1600	3200

sible with the Graflex Photorecord camera used at a standard reduction ratio of 12 to 1. Slight changes in reduction ratios should be made to fit the magnification ratio of the reader in which the microfilm is likely to be used. At the 12 to 1 reduction ratio, the Argus reader will project all material back to its original size. If the Student's microfilm reader is used, the optimum reduction ratio might be 15 to 1; and if the Recordak 35mm. reader is used, 16 to 1 might be adopted as a standard.

The great advantage of a standard reduction ratio is that regardless of the size of material to be copied, the lights and camera position need not be changed. The effective aperture will also remain constant. The lights should be set far enough away to provide even illumination over

an area approximately 20 x 20 inches. Except for the microfilming of newspaper pages 17 x 22 inches and larger, this will be satisfactory. Some economy in film cost might result in the use of higher reduction ratios, but this will usually be offset by the added cost of films with higher resolving power than that of high-contrast positive film. The special films for high reduction ratios, of course, may have a longer life expectancy than the safety positive used by the motion picture industry, but for the interlibrary loan or traveling scholar the ultimate in archival properties is relatively unimportant. The ability to handle the cheaper non-color-sensitive films in the laboratory with the aid of a light-red or orange safelight will appeal to those who process their own film.

If a fixed reduction ratio is followed, there may be some objection to the eye fatigue caused by the bright light around the margins of the image on the microfilm reader screen. This may he overcome by covering the usual black base of the copyholder with a light grey cardboard. These wasted margins can also be used to advantage by placing the name of the article or book in large letters alongside the material being microfilmed. The title will then be repeated on every frame of the film and will be of service in indexing the material copied.

After reducing variables which affect exposure to a minimum, and after accumulating experience which makes continued test exposures unnecessary, the camera operator may still want some insurance against extensive retakes, especially when operating the camera in the field where the facilities for making test exposures are not available. Frequently in field work test exposures are made of material which might have beeu representative at the start, but as the actual microfilming progresses the camera operator encounters more difficult pages than were included in the earlier tests. The resourcefnl operator will mark these pages with a slip of paper after they have been photographed. At the end of the job, he will advance the film sufficiently to provide the usual trailer strip and rephotograph one or more of these difficult pages for experimental development.

To illustrate the possibilities of compensating for minor errors in exposure, an understanding of the effect of development time on density is essential. If development is carried too far, the developer begins to act on the unexposed silver bromide crystals, the text begins to fill in and

the contrast between text and background begins to diminish. However, if development is not allowed to approach this point, it is apparent that the greater the contrast, the easier it will be to distinguish the text from the background. This contrast is measured in terms of a value called "gamma." A gamma of 1.0 indicates that the negative contrast is roughly equal to the contrast of the original. A gamma of 2.0 indicates that the negative contrast is twice the contrast of the original; a gamma of 3.0 indicates a negative contrast of three times; a gamma of 4.0, a negative contrast of four times that of the original.

Disregarding certain losses between subject contrast and negative contrast which occur each time a subject is photographed, the optimum for copying a continuous tone subject, such as a half-tone illustration, would be a gamma of 1.0. In line work where there is no need to preserve all the tones intermediate between white and black, the optimum might be a gamma of 3.0. The following table shows the effect of development on negative contrast when Eastman Microfile film is developed at 65°F. in a contrast developer, Eastman Kodak Formula D-11:

Time of Development	*Gamma (approximate)*
2 minutes	2.0
4 minutes	2.7
6 minutes	3.3
8 minutes	3.7
10 minutes	4.0

Since the recommended development time in Eastman Kodak Formula D-11 is usually stated for Eastman Microfile film as 5 minutes at 65° F., the author uses 5 minutes as a good average for all test exposures. When development is modified, the author has adopted standard modifications of 2½, 5 and 10 minutes.

After the film has been advanced to provide the usual trailer, if 3 series of double frame negatives are made of 6 of the more difficult pages, the person who develops the film will know that the last 30 inches of film contain the exposures for test development. If the film used was high contrast positive which can be inspected by safelight during development, the 30-inch strip can be placed in the developer. At the end of 2½ minutes the film can be moved from the developer and a strip of 6 exposures cut off; the remainder is promptly returned to the developer.

The first test strip is then placed in the fixing bath. At the end of 5 minutes, another strip of 6 negatives can be removed as before; and when a total time of 10 minutes has elapsed since the film was first placed in the developer, the last of the 3 series should be transferred from the developer to the fixing bath. After fixing, the results of the 3 development tests can be compared and the balance of the film developed for the length of time indicated as optimum by these tests.

If Eastman Microfile or other panchromatic film is used which cannot be cut by inspection under a safelight, some method of marking the film between test series must be used. With some cameras, by advancing the film and removing the film magazine between each series of exposures, the film can be perforated with a knife or pen. When the roll of film is removed for development, the processor will cut the film at these perforations before placing them in the developer. The author has even attached small pieces of scotch tape to the film to mark the space between the test series, but caution must be used to insure good adhesion between the tape and the film. Loose pieces of scotch tape left in the film magazine would, of course, be a source of future trouble.

To the novice in microphotography, test exposures and test development of film may seem to be time-consuming and unscientific. He may even begrudge cost of the required film. Experiments, however, are the basis of science and a scientific approach is difficult without the knowledge of the fundamental principles developed through a study of many trials and many errors. The more foolproof equipment is usually not available to those persons with the least microphotographic experience. The quickest way for the novice to become expert is to make some trials and study the errors. In the long run, time will be saved. Documentary photocopying differs from amateur snapshooting in that hundreds of exposures may be made in a short time and that bad guesses in exposing film may lead to costly retakes, weeks after an expensive field trip has been completed. Several years' experience in helping novices master the use of the simpler types of microfilm cameras has led the author to the conclusion that a person with some previous photographic experience, feeling that he knows enough about photography to plunge right in without some experimentation, wastes more time and film than the complete novice who knows he must experiment. Time and again, the camera manu-

facturer can trace troubles blamed on his product to an operator who has neglected to learn the difference between documentary copying and pictorial photography.

The techniques of photographic copying are not difficult for even the novice to master if he will take some pains at the start. Standardization of reduction ratios with fixed light positions and the use of one type of film and one developer formula at a standard temperature will eliminate troublesome variables. The remaining variables are the light-reflecting properties of the paper and the character of the text. It is hoped that the modifications of laboratory practice suggested in this article will prove as valuable to others as they have been to the author in reducing difficulties with these final inescapable variables.

Recordak Microfilm Enlarger

VERNON D. TATE

THE FIRST ENLARGER specifically designed for the making of paper prints from microfilm has been marketed by the Recordak Corporation as the Recordak Enlarger, Model A. It consists essentially of a lamp house, film holding and transporting mechanism, lens and calibrated tape mounted on a bracket which is arranged to slide on a metal tube approximately 38 inches in length. The tube is mounted by special brackets on a wooden board approximately 6 x 39 inches in size, and the board in turn is intended to be mounted on the wall of the darkroom. For ordinary ratios of enlargement a paper easel is placed on a table approximately 31 inches in height, but extreme enlargements may be made by placing the paper easel on the floor.

The lamp house is spherical and made of metal, and contains a 150-watt photo-enlarger lamp. A condenser barrel with condensers forms the lower portion of the lamp house. The assembly is hinged and may be tilted back to clean the optical flats. The film gate consists of two glass flats which are manually opened. They are accurately positioned so as to hold the film flat in the focal plane during exposure. Real spindles with winding cranks are provided to accept either 16mm. or 35mm. standard spools. The film is drawn from supply to take-up spool by tension and without mechanical aid. The maximum film image area is 1¼ x 1¾ inches (approximately 32 x 44mm.). The lens supplied is specially corrected for microphotographic work and is nominally 63.5mm. equivalent focal length, f/4.5 stopped to f/8.0. It is calibrated in diameters enlargement based on focal distances of normal focal length lenses.

Enlargements of from 8 to 30.5 diameters may be obtained with the instrument. For 10 to 21 diameters enlargement the paper holding easel is placed on a table 31 inches high; for 20.5 to 30.5 diameters enlargement,

the paper holding easel is located about 7 inches from the floor; 8 to 10 diameters enlargements are secured by elevating the easel above the surface of the table. A flexible metal tape for focusing is mounted on the lamp house assembly, and is calibrated in diameters of enlargement. When the lens setting agrees with the type reading, the enlarger is in

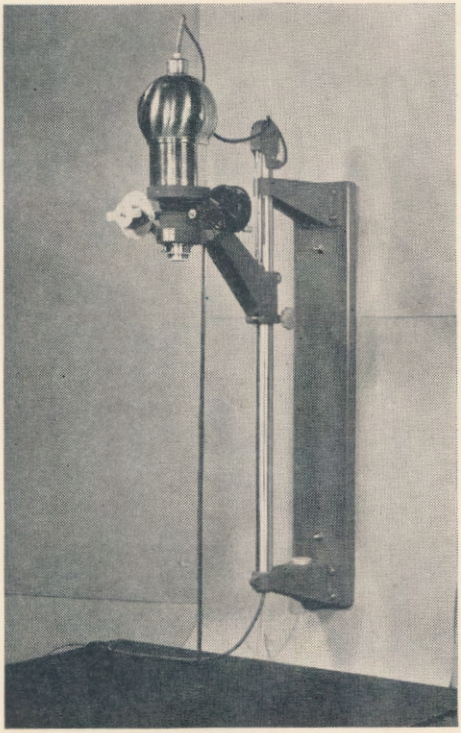

FIG. 1.—*Recordak Microfilm Enlarger, Model A*

proper focus for that degree of magnification. A locking screw is provided to hold the tape in position if desired.

The enlarger is in every sense a precision instrument capable of quantity production of paper prints from microfilm negatives. It must be mounted on a rigid support that is absolutely free from vibration. The optical axis and the paper holder must be carefully adjusted for perpendicularity through the use of a level. The enlarger itself must also

be levelled in both directions. If carefully installed and operated, work of excellent quality may be produced.

The enlarger was originally intended to sell for $225 f.o.b. the nearest Recordak office, but existing conditions may require an alteration in this price at any time.

NEWS and TECHNICAL NOTES

Additions to the File Microcopy Program the National Archives

Certain additions have been made to the file microcopy program of the National Archives (see JOURNAL, March 1941, p.9-14). These include: reproductions of a letter book of the Creek Trading House, 1795-1816 (1 volume); confidential and unofficial letters sent by the Office of the Secretary of War, 1814-47 (2 volumes); letters concerning military affairs sent by the same Office, 1830-36 (4 volnmes); letters sent by the Washington Snperintendency of Indian Affairs, 1867-72 (2 volnmes). Positive microfilm prints on 35mm. film, placement II, are available to interested institntions and individnals. Requests should be directed to the Director of Reference Service, The National Archives, Washington, D.C.

Binkley Books Still Available

In a previous number of the JOURNAL announcement was made of the availability of the *Manual on Reproducing Research Materials* by the late Dr. Robert C. Binkley (Ann Arbor, Michigan: Edwards Brothers, 1936). A few copies still remain, and the former price of $3.50 has been reduced to $1.75. Orders should be sent to the American Library Association, 520 North Michigan Ave., Chicago.

The *Manual* was the first detailed account of the many modern techniques of documentary reproduction. It resulted from a survey made for the Joint Committee on Materials for Research of the American Council of Learned Societies. In one sense it is the parent of the JOURNAL, for one of the reasons behind the establishment of the JOURNAL was the desire to continue the work of the *Manual* and keep it up to date. While shorter surveys have appeared snperseding portions of the material covered, the *Manual* is still the only basic reference volume on these subjects.

British Records Association Meeting

Despite wartime conditions the Ninth Annual Conference of the British Records Association was held on November 11, 1941 at Vinters

Hall, London. The preservation, repair and safeguarding of documents, and microphotography were included in the program. A summary of the discussions containing valuable information on the photographic restoration of documents damaged by fire or water has reached this country. The discussions emphasized the importance now being assumed by microphotography in England as a medium for preserving not only archival and record material of historical or scholarly value but also for preserving business and industrial records required for immediate use.

Connecticut Courant 1764-92 on Film

The Connecticut Historical Society has just issued a microfilm file of the *Connecticut Courant* from 1764-92. The *Courant* is one of the oldest newspapers in the country and claims to be "America's oldest newspaper of continuous publication." It was one of the leading sources of news for the colonies, and played a leading role in the years of the American Revolution, especially with the occupation by the British at various times of Boston, New York and Philadelphia. It is said in 1788 to have circulated 8000 copies of each issue. Through the cooperation of the Library of Congress, the New York Historical Society, Massachusetts Historical Society, Yale University, Connecticut State Library and the Hartford *Courant* offices, issues not represented in the file in the Connecticut Historical Society have been included.

The file is on 35mm. nonperforate film 378 feet in length, containing 5624 pages. Placement II was adopted, thereby utilizing all available space and permitting 16 pages to be placed on each running foot of film. The filming was done by the Graphic Microfilm Service of Waltham, Mass., through its agent in Hartford, the Case, Lockwood and Brainard Company. The price for positive copies of the file is $44.63, and orders or correspondence should be addressed to Mr. Thompson R. Harlow, Librarian, Connecticut Historical Society, Hartford, Conn.

Current Microphotographic Service in France

Supplementing a previous announcement in the Journal (September 1941, p.193-94) further information about the microfilm service of the Centre National de la Recherche Scientifique is now available. It is stated that the Service de Documentation of the Centre is in a position to supply photographic copies of books in practically all French public, university and scientific libraries. Two services are now in operation, one in Paris, and the other

in Lyons; hence the resources of those areas are most accessible. Standard 35mm. film is used and the prices are comparable to those currently charged by similar agencies in the United States. Inquiries should be addressed to the Service de Documentation, Centre National de la Recherche Scientifique at 18, Rue Pierre Curie, Paris V^{e}, and 31, Place Bellecour, Lyons, France.

Document Preservation Service

A "Laminate" service is now being offered by the Yellow-Platinum Company of America, Norwalk, Conn. Cellulose acetate foil in thicknesses ranging from .001 to .020 inches may be coated on one or both sides of a document solely through the use of heat and pressure, and without adhesives. The product does not shrink or change, the coating cannot peel off, and the document becomes acid, grease and waterproof. Prices range from 1 to 2 cents per square inch.

Film Strip Files

A file envelope for 35mm. film in strips of six double frame exposures is being marketed as the Kwik-vu file by the Warren Photo Laboratories, 18 Waverly Place, New York. The files are made of clear plastic non-inflammable material, and are flexible while retaining sufficient rigidity to prevent curling. A three-line paper indexing label is incorporated, and the over-all length of the strip is 10½ inches. The primary purpose of the file is to protect the negatives from scratches, dust, abrasion and kindred hazards. In this connection, the material used is said to be clear enough to permit inspecting or even printing negatives without removing them from the file envelope. Prices range from 75 cents per dozen for the file envelopes to $5 for a file box containing 96 file envelopes.

Microcopying, A New Ilford Service

Before the war considerable interest had already been attached to the recording of documentary records on cinematograph film, and it is a subject to which frequent reference was made in our pages. The ease and rapidity of the manipulations, the ready accessibility of the copies and the small storage space required for their safekeeping were all factors in favor of the wide extension of this method of securing copies of valuable records.

The war has given it an additional importance and it has been widely used throughout the country. Further points in its favor in this connec-

tion are that it is economical in sensitive material and all the necessary materials are free from the Limitation of Supplies Order.

Ilford, Ltd. have recently issued a new booklet, *The Technique of Micro-copying,* which is certain of a warm welcome from all interested in the subject, whether as potential users of the process or as its practitioners. The booklet gives information and advice concerning apparatus, arrangement of subject, precautions prior to exposing, especially useful notes on exposure, fixing, washing and drying and other technical details which will be found extremely useful.

Ilford, Ltd. have marketed a new Micro.-Neg. Panchromatic Film especially for micropying, and this is available in both 16mm. and 35mm. widths. It is coated with a slow emulsion capable of giving extremely high resolving power; an average exposure under practical conditions is one second at f/11. This film is strongly recommended, but faster films, either panchromatic or non-panchromatic, are available.

In the 35mm. width the films are supplied in rolls of 102 feet, packed suitably to fit various types of apparatus. In this length they are free from the Limitations of Supplies Order, and free from Purchase Tax.

The price per 102-foot reel of 35mm. F.P.2 Film (panchromatic) is 24s. net. In the 16mm. size the price per 100 foot is 17s. 3d., plus 5s. 7d. purchase tax; and for 50 feet, 9s. 6d., plus 3s. 1d. purchase tax.

A further service provided by Ilford, Ltd. is the processing of all types of microcopying negatives. The work is economical when carried out in bulk, so that prices are relatively low, the charge per 100 foot being 6s. Contact prints and enlargements may also he obtained through this service. One of the objects which Ilford, Ltd. have in view in offering this processing service is to help to keep up the quality of microcopying, as it can so easily deteriorate if adequate precautions are not taken at every stage. Every negative processed is carefully examined and a report on quality is supplied with every roll. In this way it hopes to enhance the reputation of photography in the widely extended commercial field which microcopying is opening up.—*Journal of the Royal Photographic Society.*

Microfilm Abstracts

The latest issue of *Microfilm Abstracts* (Vol.III, No.2), containing 119 pages including a cumulative index of titles, has recently been distributed. There have been numerous requests for a collation of all numbers issued to date. As supplied by Mr. Eugene B. Power the collation is as follows: Vol.I, No.1; Vol.II, Nos.1 and 2; Vol.III, Nos.1 and 2. For ad-

ditional information about this service see "University Microfilms" in the JOURNAL, March 1939, p.21-28, 44-45.

MICROPHOTOGRAPHIC SERVICE AT UNIVERSITY OF COLORADO

The University of Colorado Library is now equipped to make 35mm. negative film reproductions of books, magazines, pamphlets, pictures, charts, diagrams, etc., at the following tentative prices.

Books, magazines, pamphlets: will cost 2 cents per exposure (usually 2 pages) with a 25 cent service charge for each title.

Pictures, charts, diagrams: will cost 2 cents per exposure with service charges of 5 cents for each change in size, when this involves changing the reduction ratio, and 25 cents per job. These charges may vary according to the nature of the job.

Rush jobs, requiring the immediate developing of less than 100 feet of film, will cost $1.25 in addition to the regular charges.

Positive film or prints cannot be made at present by the library, but the library will undertake to have such work done by commercial firms at whatever price the library is charged.

Spools with a capacity of 100 feet of film will be provided, if desired, at 15 cents each.

Orders will be accepted from libraries and responsible individuals, and the library will undertake to borrow material for filming which is not available in its own collections. Such borrowing, of course, depends upon the policy of the library owning the material. Send your orders to my office.

Equipment now available in the University Library includes a Microfile Recordak Camera Model D and a Graflex Photorecord camera with book cradle and motor compressor. Argus and Optigraph reading machines can be used in the Documents Reading Room.—RALPH E. ELLSWORTH.

MICROPHOTOGRAPHY IN INDIA

According to information received by the Division of Indic Studies, Library of Congress, the Royal Asiatic Society of Bengal has been receiving numerous requests for microfilm copies of various manuscripts from many parts of India and America as a result of the project established by Dr. H. I. Poleman of the Division of Indic Studies, with the cooperation of the American Council of Learned Societies. Wartime conditions have imposed limitations as described in the following extract from a letter recently received:

We are finding considerable difficulty owing to the prevailing war conditions. Not only the cost of photographic materials has gone up tre-

mendously, but also there is some difficulty in getting them, especially the microfilms. We have purchased a good quantity from Messrs. Kodak and Co., but it is not impossible that in the future we may not get all that we want. The rate that we charged before for microfilming based on actual cost, had to be increased a good deal but this is inevitable under present circumstances.

American libraries and other institutions which fill orders from India for microfilm should send the film directly to the institutions originating the order. However, in every case, notice should be sent at the same time by the American Library to the Secretary, Central Board of Revenue, Secretariat, New Delhi, India, describing the nature of the filmed material and giving the address of the Indian institution to which it is being sent. These arrangements have been worked out with the Department of State and the Government of India, and will mitigate difficulties which might otherwise be encountered in the delivery of the film.—H. I. Poleman.

Minutes, Governing Body International Labour Office Available on Microfilm

At the request of the University of Pennsylvania Library, the Columbia University Libraries have made a film negative of the Minutes of the Governing Body of the International Labour Office, sessions 1-52, November 1919 to April 1931. These minutes were printed but not published in a very small edition for distribution to the members of the body.

The film is 35mm. perforated, 900 feet in length, 7000 exposures, 2 pages per exposure, suitable for use on the Argus or any standard reading machine.

A price of $80 for a positive print has been fixed, with the expectation that enough orders will be received to absorb the cost of the negative. Orders will be filled as rapidly as possible in the order of their receipt. Address the Director of Libraries, Columbia University, New York.

Photographic Laboratory, Brown University

The Laboratory had its second anniversary in December 1941. Reports of its activities have appeared in the Journal from time to time (Vol. III, p.104-08, 200-03; Vol. IV, p.26-27). While in the beginning the work of the Laboratory was almost exclusively for the *Mathematical Reviews* and for the expansion of the Brown Mathematics Library, miscellaneous orders from University departments and from outside sources have gradually assumed significant proportions. Positive printing of film made in South America

under the Latin American Microfilming Project has recently become another important activity.

Since the establishment of the Laboratory in December 1939, about 400,000 exposures have been made for the Mathematics Library at Brown. A little less than 5000 articles have been filmed for the Mathematical Reviews and stored in the files. Copies of about 1650 of these articles have been supplied to *Mathematical Reviews* subscribers. Greatly increased demand for these copies has been noted during recent months.

From the Latin American Microfilming Project, the Laboratory has so far received 64 reels of microfilm made in the National Library, Santiago, Chile. These reels contain 995 titles totaling about 36,000 exposures. The cataloging and printing of this material is well under way. Apart from this service of the major projects, there has been a great amount of miscellaneous reproduction work. Six hundred and fifty 3¼ x 4 inch and 6900 2 x 2 inch lantern slides were made. Of the last, 230 were in color. More than 15,000 paper prints have also been produced. Some special experimental work in color photography has been undertaken by the Laboratory under the direction of Professor Carl W. Miller of the Physics Department at Brown University and with the support of the Carnegie Corporation.

There follows a short list of equipment acquired since the last list was published (JOURNAL OF DOCUMENTARY REPRODUCTION, June 1940, p.104-08):

1. Photorecord camera. Most book work is done on the Microfile camera. However, for work at low reductions, the Photorecord proved very useful after it had been somewhat changed so that pictures can now be taken at all reductions up to a magnification of more than 2 to 1.
2. Depue continuous printer.
3. 4 x 5 Deardorff camera, Goertz Artar, f/9.
4. 4 x 5 Speed Graphic with Zeiss Tessar, f/4.5.
5. Saltzman camera stand.
6. 2 Saltzman camera lamps on stands.
7. Curtis color printer.
8. Eastman Kodak 4 x 5 enlarger.

The Microfile camera, Model C, was adapted for use at 1:9 and 1:7 reductions by means of accessory lenses. The use of these accessory lenses necessitates raising the material into the focal plane.—EDWARD C. ROOSENRUNGE.

PHOTOSTAT ADAPTED TO MAKE MICROFILM ENLARGEMENT PRINTS

Libraries interested in making projection prints from microfilm will be glad to know of an adaptation of the Photostat to this purpose which has been made at Columbia University Library. By removing the lens

and prism and setting up a projector in front of the aperture, thus made, so as to project a direct image on the sensitized paper, enlargements may be made with all the convenience of simple photostat prints. The routine of photostat processing can be carried on for these prints undisturbed. The necessity for a change to an enlarger or other printing device is obviated. The change from photostat to projection printing involves no more than the removal of the lens and the substitution of the projector in its place. In the Photograph Division at the Columbia University Library a shelf which swings back out of the way when the projector is not in use has been attached to the Photostat to support the projector in the proper position for the best results. This shelf is adjustable at two levels for printing on whole and half sheets. For convenience in focusing, a screen has been attached to the other side of the Photostat. This is also arranged to allow for the making of prints of two sizes. It is so placed that, when the projector is in position for focusing, the distance from lens to screen is precisely equal to that from lens to paper surface when the print is made. After focusing has been accomplished in this manner, the projector is swung into working position and prints can be made with great facility and rapidity. The Photostat can he restored to its original use in a moment.

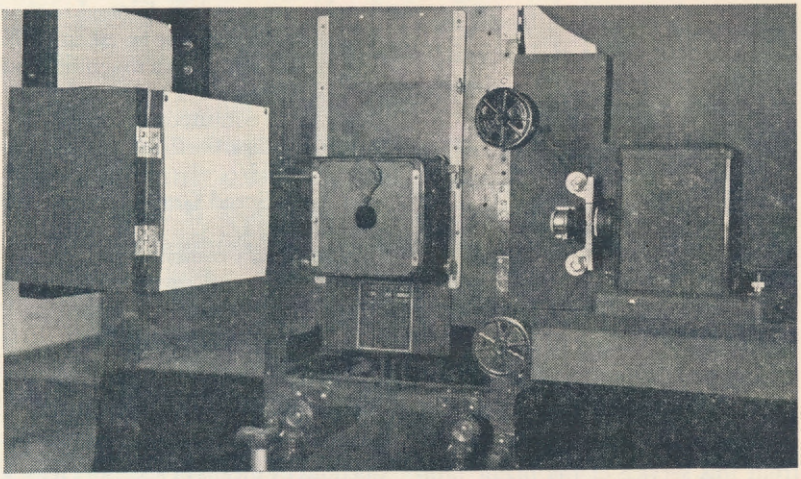

FIG. 1.—Photostat Machine Adapted to Make Paper Prints from Microfilm (Columbia University)

In common with most other laboratories the one at Columbia University Library has no room to spare.

Instead of a round drum dryer a tall slender two drum dryer was built. The two drums are connected by a

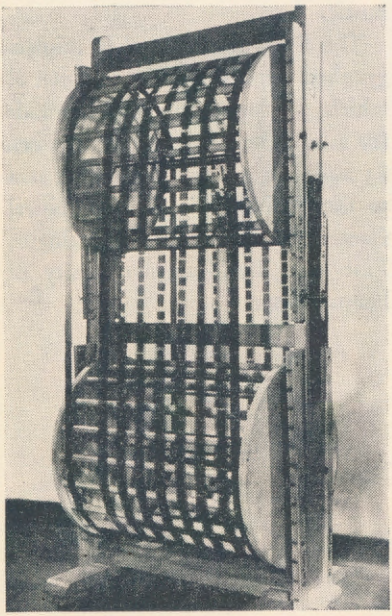

Fig. 2.—Vertical Twin Drum Microfilm Dryer (Columbia University)

belt to which the end of the film is fastened and which guides it around both drums. This will take 100 feet of film at a time and fits in a space 24 x 30 inches.—M. A. Bennett.

Students Reader Accessories

The simplified microfilm reader developed and distributed on a limited basis by the Committee on Scientific Aids to Learning has been placed in production by the Spencer Lens Company of Buffalo, N. Y. As now marketed, the instrument is known as the Spencer Microfilm Reader, and a four-page booklet bearing this title, and describing and illustrating the machine, may be secured from the Spencer Lens Company or its branch offices in the larger cities. The branch offices also keep in stock replacement parts, including bulbs, glass filmbooks and extra screens. As originally distributed the reader was intended for use with relatively short rolls or strips of 35mm. microfilm, but as the need for a holder for full 100-foot rools soon became evident, an accessory of this type was provided. It consists of a metal plate carrying two standard 100-foot spool holders with cranks to revolve the spools, and a pair of glass flats that are manually opened by means of a handle. The reel holder will fit most machines without alteration although some of the earliest models may require a minor change. It is attached by the use of two small thumbscrews in holes already provided. The announced cost of the roll holder is $15.

Union Checklist of Microfilms in American Libraries

The Philadelphia Bibliographical Center and Union Library Catalogue through its Committee on Micro-

photography will issue in February or March a compilation provisionally entitled "Preliminary Union Check List of Microfilms in American Libraries." The list, comprising more than 5000 items, most of them rare and some unique, has been made possible by the contributions received from nearly every important library in tbe country, 93 institutions in all. Journals, manuscripts and newspapers, as well as books, are included. The list should be useful not only to libraries but also to individual scholars, especially persons working in the fields of American history—particularly local history—language, literature and literary history and music.

The list will be issued in mimeographed form in a limited edition of which 125 copies only will be made for sale. The price will be between $3 and $4. Orders should be sent to the Philadelphia Bibliographical Center and Union Library Catalogue, Fine Arts Building, University of Pennsylvania.

FOREIGN SECTION

Photocopying: Its Progress and Equipment.*

M. C. Trivedi

The idea of copying by photography written matter such as manuscripts, documents, etc., was found appealing from the earliest days of photography, and especially so from the beginning of the present century. Compared to the laborious method of hand copying, advantages inherent in photocopying are quite obvious. They are: a facsimile reproduction without any chance of error so common in any system of hand copying; the rapidity of reproduction; and freedom from the necessity to know the language of the mannscript copied on the part of the machine, i.e., the camera unlike that in the case of the man, i.e., the scribe engaged in hand copying.

2. One should have therefore expected the progress of photocopying much more widespread and intensive than what we find it today after about half a century of the birth of the idea of photocopying. There were, however, obstacles in this direction which did not allow its use to be as extensive as its manifest advantages would seem to merit.

3. The main obstacle retarding the progress of photocopying was its cost; and until lately, as shown hereafter, this had not been gone over. With all its obvious advantages, the photographic method of copying was a costly one almost prohibitively so compared to hand copying. The latter method required paper, ink and a scribe; the photographic method required costly cameras, plates and papers and chemicals besides expert labor.

4. In the beginning the ordinary plate camera used for taking pictures was made use of for occasional casual work of copying. With the rapid growth of industry and business with the advent of the present century, commercial houses and public departments felt the necessity of a facsimile duplication of their cheques, bills, documents, etc. The typewriter

* Supplementing a paper by the same author previously reproduced in the *Journal* (March 1941, p.68-71), the present study was read at the Public Meeting of the Sixteenth Session of the Indian Historical Records Commission held at Calcutta, India in December 1939.—EDITOR.

though satisfying the need of cheap and rapid duplication could not come up to the standard when *facsimile* duplications were required. The necessity for a photocopying machine became increasingly evident.

5. The first of these machines to be put on the market was the photostat. It was followed by lucigraph, rectigraph, etc., all more or less working on the same principle. The photostat directly photographs through the aid of a prism and lens the original writings on a sheet of photographic paper. The result obtained is thus a negative one, i.e., the photograph is in the form of white lettering on a black hackground unlike that in the subject copied; it is in fact a paper negative. If this is photographed again the result can be had in tbe form of a positive, i.e., black lettering on a white background such as we find in the originals in the ordinary conrse. The photostat does developing and fixing of prints inside the machine itself.

6. The initial cost of installation of a photostat comes to about Rs. 8000 or so; it weighs a good deal and is on that account not portable from place to place. The cost of taking a negative photo copy of the size 12 x 7½ inches may come to about a couple of Rupees.

7. On account of its high cost, the photostat has so far been the proud possession of a few well-flourishing concerns or individuals who can afford to go in for it. It is unquestionably beyond the means of ordinary institntions, much less individual scholars.

8. From time to time the idea of copying documents on cine film was attracting attention. It was realized that here was a method in which it was possible not only to photograph in facsimile but also very cheaply and in small space. The principle was to photograph the original at a great redncti on and then from the reduced image on the film to prepare an enlarged print of any size desired. Tbe whole cost of the intervening negative—the costliest part of taking a photograph—was thus aimed to be rednced to a minimum. But the technical difficulties involved in great reduction snch as the fineness of grain of the emulsion, utmost critical definition and resolving power of a lens suitable for this purpose, etc., did not allow mnch headway to be made to realize the desired goal.

9. One of the outstanding achievements of the present century in the domain of photography was the origin and development—now almost to perfection—of what is called miniature photography. During the years just preceding the War, Mr. Oscar Brown in Germany conceived the idea of miniature camera, i.e., camera which gave small photographs 1½ x 1 inch on an ordinary cinema film. These small photographs were to be enlarged subse-

quently on paper to the size required. Before, however, the idea could be worked out in practice, the Great War broke out, and the commercial exploitation of this idea had temporarily to be suspended.

10. The first use of film for copying purposes was made in the Franco-Prussian War of 1870 during the siege of Paris when messages were sent photographed on small rolls of film tied to the necks of trained pigeons from the besieged city, and read at their place of destination by means of projectors. These miniature or microphotographs dating back to about 1870 were recently exhibited at an exhibition of photographic reproduction of documents held at the Science Museum, London.

11. During the postwar period, the commercial exploitation of the miniature camera gradually developed. Foremost amongst these was the Leica manufactured by the well-known firm of Leitz. At first the cameras were manufactured for taking pictures only, but later its use in other directions such as that for copying was extended and various accessories came to be manufactured for copying work. The capacity of the camera was raised also in one of its models to that of 250 exposures at one loading, instead of the usual 36 exposures, to accommodate the needs of voluminous copying. This model is called "Leica 250" and was put on the market in 1935.

12. With the perfection of the miniature camera the main obstacle to photocopying — of cost — was removed; and the idea received a great impetus. In America in particular, the advance in this direction is tremendous. The United States is using the film method in many of their departments for permanent preservation of records. The Census Bureau of the United States is engaged in making a complete film record of the U.S. Census of the year 1880. This comprises some 50 million names and records. The census authorities in the U.S. Department of the Interior are using the film method for the recording of birth and death certificates for the whole country. The National Archives, Washington, are keeping their vast amount of records on film for which purpose they have set up a special Department of Motion Pictures and Sound Recordings. Libraries, universities and historical societies all over have set up special staff and equipment for purposes of copying on film. Amongst these may be mentioned the University of Chicago Library, Harvard University Library, Minnesota Historical Society, The National Archives, New York Public Library, Yale University Library, Pennsylvania Historical Society, etc.

13. With the rapid growth of film copying in America, manufacturing firms there took interest in devising special cameras for the same. Chief

among these are the Graflex Photo Record Camera put on the market by Folmer Graflex Corporation; and the Recordak sold by Messrs. Kodak, Ltd., Very efficient devices to read easily, on a highly magnified scale, the contents of the miniature negative are also manufactured and sold.

14. It may be of interest to mention that other countries are following suit, and rapidly the idea of copying records on film is gaining now world wide recognition. For instance, it has been stated that the Oxford University Press has made arrangements whereby all books going out of print shall be available on the film. The University Library of Rochester, N. Y. is recording on film the first 2000 books printed in the English language, most of them printed by Caxton between 1470 and 1550. The Scandinavian countries were, it is reported, quick to realize the obvious advantages of microphotography; among other institutions there the Royal Library at Copenhagen and the University Library at Upsala have had microphotographic installations. Sweden is also using tbe method in a large number of her pnblic departments.

15. The very considerable saving in space afforded by microfilm copying has prompted many newspapers in America to adopt this method for the preservation of their daily issues. The space required for storing microfilms is, it is estimated only 2 per cent of that required ordinarily. Recently the *New York Times* had about 90,000 pages of its issues covering the years 1914-18 copied. It is reported that about forty American newspapers are now regularly filing film copies of their daily issues.

16. The microfilm method has effectively solved the problem of cost both initial and running for those who need copying to be done for their multifarious work. The camera and all its accessories including those for processing and enlarging or reading cost but only Rs. 1500 (as agaiust Rs. 8000 or so for the photostat); *vide* list of equipment attached. Materials like film and chemicals for as many as 250 exposures cost but Rs. 3 to 4 only. Including labor and other overhead charges, it bas been worked out that the whole cost of photocopying a side does not exceed one anna.

17. Due to its extreme cheapness, which, to say the least, is almost incredible, great economy in space, and ease of manipulation, the film process is marked ont as the photocopying method of the future. Old photographic methods such as the photostat are receding rapidly into the background, giving place to the film. The position in this respect is aptly summed up in the following extract from the *British Journal of Photography*:

While the use of the Photostat in large Mercantile houses, banks, and Government Departments for the

production of facsimile copies has proceeded apace, it is not unlikely that the Microphotographic method will largely supplant it for all cases where records have to be kept for any length of time and preserved as legal or historical Documents. Already the United States Census authorities use Microphotography for the recording of Birth and Death Certificates for the whole country.

A note appearing in the issue of November 1938 of *American Photography* is also illuminating in this respect:

During the past several years, the copying of various kinds of printed matter for permanent Record on 35-mm. motion picture Film has been rapidly displacing in libraries and other institutions the older system of photostating. The method is applicable to any kind or size of printed materials; newspapers, magazine articles, even entire hooks. Its great advantage over the Photostat is economy both in money and storage space, for the material cost of copying one page is in the neighborhood of two-tenths of a cent, and the hulk of the Film copy is usually less than five per cent. of the original. Also, extended recent investigations carried out at the National Bureau of Standards have shown that Safety Base (Acetate) Film is as permanent as high grade paper if stored under reasonably good conditions.

18. The question of permanency of records photographed on the motion picture films has been investigated by the Bureau of Standards, U.S.A. There are at present two kinds of motion picture films available on the market. The first is the ordinary cinema film which we see projected in cinema houses. Its base is cellulose nitrate which is a highly inflammable substance, and is known to suffer spontaneous disintegration under great fluctuations of temperature and humidity. It is in fact not very useful where permanence is desired. The other kind of motion picture film is what is called the acetate or "safety" base film. It is made of cellulose acetate and is, therefore, not inflammable unlike the ordinary nitrate film, from which it derives its name as a "safety" base film. It is stable and does not show any tendency to disintegrate. Recent extensive investigations carried out by the American Bureau of Standards have shown that its chemical stability is much greater than that of papers of maximum purity for permanent records. It has been, therefore, recommended for use where records are to be reproduced on film for permanent purposes. The films are to be stored in a cool atmosphere where there are no violent fluctuations of temperature.

19. It may be interesting to mention in this connection that a third kind of motion picture film on metallic base is now reported to have been put on market quite lately. It is the 35 mm. aluminium base film and is manufactured by the Fischer Film Corporation, U.S.A. This film is an

improvement on the present day celluloid films in two respects; one is that the photographic image can be taken on both sides of the film, unlike that on the celluloid films where the image is only on one side and the other side is clear celluloid; this will still reduce by half the storage space. The second is that the metallic base is considerably stronger and more lasting than the celluloid one and requires no special conditions for storage.

20. One other advantage of filming deserves to be mentioned. Copies from the film negative roll can be made very cheaply and quickly with the aid of a very small machine if required. This is a great facility when in libraries more than one scholar applies for the copy of a manuscript at one and the same time. The duplicating machine required for this purpose costs only Rs. 250.

21. At times for purposes of publication or circulation it is required in libraries and record houses to print in *facsimile* original manuscripts *in hundreds* of copies. This also is now rendered possible by such machines as the Rotaprint. At present publication of such manuscripts is mostly in the cast type forms; advantage of their publication in *facsimile* gives them a decidedly original appearance.

22. It is possible to split up the operations of filming into two parts —exposure and processing. Manuscripts can be photographed on the film at one center, say a record office or a library; and the exposed film can be sent to another place say a photographer's studio for processing. In this case, it is not necessary for the institution filming its records to go in for the processing outfit to be installed in its premises. This method has been tried in the case of records of the Bombay Government which are photographed by the Government Photo Registry, Poona, and has been found to be successful. Records are photographed (exposed) in the Secretariat Record Office at Bombay, and spools of exposed film are sent in the evening with a messenger to Poona for processing the next morning. About a thousand sides are thus photographed and processed daily.

23. The space required for carrying on the work is very small. A room 15 x 12 feet is sufficient for the exposure part; and another 20 x 15 feet for the processing if the latter is also intended to be done at the same place. In the other room about half a dozen water taps and three or four electric plug points will have to be fitted up. In the first room only three or four points are necessary.

24. Summing up the present position with regard to photocopying it may be said this has now been gaining world wide recognition thanks to the perfection of the microfilm method in recent years. Older photographic methods which were costly

and cumbersome are fast giving place to the film method, which has been marked out as *the* scientific copying method of the future free from the errors of human copying, and available at a comparatively very cheap cost. Its use for libraries, record offices, research institutes, historical societies, in fact, everywhere where facsimile copying is a necessity is assured; and it is hoped it will find its due place in Indian institutions as well.

EDITOR'S CORNER

The Writers

DR. D. H. DAUGHERTY is Special Advisor, American Council of Learned Societies, Washington, D.C., and Secretary of the Council's Committee on Microcopying Materials for Research. MR. PAUL VANDERBILT, Librarian of the Philadelphia Museum of Art, is now on leave from that institution to undertake a special assignment in the Navy Department, Washington, D.C. MR. VERNON D. TATE, Editor of the JOURNAL, is Chief, Division of Photographic Archives and Research, The National Archives, Washington, D.C. PROFESSOR WILLIAM THOMAS MORGAN is Chairman, Department of History, Indiana University, Bloomington, Indiana. DR. L. BENDIKSON, an Associate Editor of the JOURNAL, is in charge of the Department of Photographic Reproduction of the Huntington Library, San Marino, California. DR. A. F. KUHLMAN is Director of the Joint University Libraries, Nashville, Tennessee. MR. DANIEL F. NOLL, formerly microfilm consultant on War Department Records for the Works Projects Administration, is now associate microfilm technologist, The National Archives. MR. M. C. TRIVEDI is Supervisor, Government Registry Office and Photographic Expert to Government, Poona, India.

Microphotographs by Pigeon Post, 1870—by Airgraph, 1941

In 1870, microscopic despatches by pigeon post solved the perplexing problem of sending messages to Paris after Prussian troops investing the city had methodically severed all other existing lines of communication. The achievements of M. Dagron and his assistants in escaping from Paris by balloon with enough photographic equipment to set up a laboratory in Tours and produce microfilms, which can still be read today, partake of the spectacular.

In 1940, a means was sought to expedite the sending of mail from British Expeditionary Forces in the Middle East to England. Microphotography and Airmail were again combined to produce the Airgraph Service. In prosecuting the war, large numbers of troops from the British Isles were sent to Egypt, and normally their letters to relatives and friends required two to three months for delivery. Regular Airmail would

have proved both expensive and impractical by reason of the physical bulk of ordinary letters. The Airgraph Service provides the sender of a message with a special form measuring roughly 7 x 7½ inches; the message on this form is passed to the censor; after being censored the message is microfilmed and reproduced

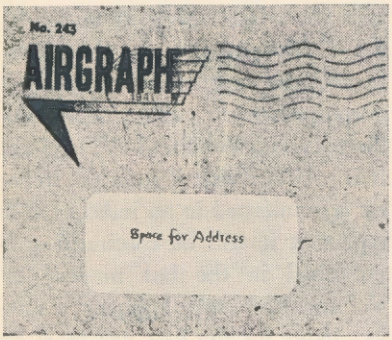

FIG. 1.—Envelope used for Airgraph Messages.[1]

as a negative on 16mm. microfilm. Approximately 2400 letters can be reproduced on a roll, 100 feet in length, weighing about four ounces. After processing, the film is sent by regular military airplane to a receiving office in London. Here, an enlarged print approximately 4¼ x 5½ inches in size is made on photographic paper. The print is folded, and forwarded in a special envelope 3⅞ x 4½ inches in size to its destination. In one case, presumably typical, an airgraph letter sent from Egypt was received in England by the addressee in five days. The cost of this service is about 3½d. or approximately 10 cents.

The parallel between this service and that inaugurated by M. Dagron is striking. In both cases, the original message was prepared in a special format, reduced photographically and sent by air; in Dagron's place, in a quill pellicle attached to the leg of a carrier pigeon; at the present time, as a roll of negative microfilm in a

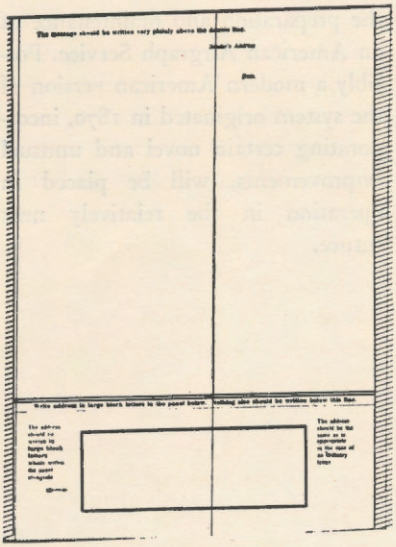

FIG. 2.—Enlargement of Airgraph Message Blank.[2]

military airplane. Projection paper prints were made in both cases.

World War II is a war of vast distances, expeditionary forces, and ten-

[1] Note cut out for address which is written at bottom of message blank. The envelope is made of thin sulphite paper and is brown in color.

[2] Note box below double line for address.

uous communication lines. Radio, cable, and telegraph are available but expensive, and must be employed with discretion. Regular mail by sea or land is slow and liable to interruption. The morale of troops in the field can be materially increased by rapid communication with relatives and friends at home. The function of censorship to prevent a leakage of military information is infinitely easier if a uniform system of communication is used. Equipment and facilities exist that could be used for the preparation and maintenance of an American Airgraph Service. Possibly a modern American version of the system originated in 1870, incorporating certain novel and unusual improvements, will be placed in operation in the relatively near future.

Annual Index and Title Page

In accordance with the conventional practice of past years, an annual title page and a comprehensive index follow immediately after the Editor's Corner. The annual title page should be removed and placed before the first issue for the year when Volume IV is bound.

Miss Frances Christeson, Reference Librarian, University of Southern California, Los Angeles, California, has prepared and maintained a comprehensive subject index for the JOURNAL, Volumes I-IV, 1938-41. It is projected that if sufficient interest is manifested in an index of this type that it will be continued and published in the last number of Volume V, thereby applying a subject index for the first five years of the JOURNAL.

The Journal of Documentary Reproduction

1941

Volume 4

A QUARTERLY REVIEW OF THE APPLICATION OF PHOTOGRAPHY AND ALLIED TECHNIQUES TO LIBRARY, MUSEUM AND ARCHIVAL SERVICE

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